

C 55.32/6 : 4522

Key Largo Coral Reef Marine Sanctuary

Management Plan

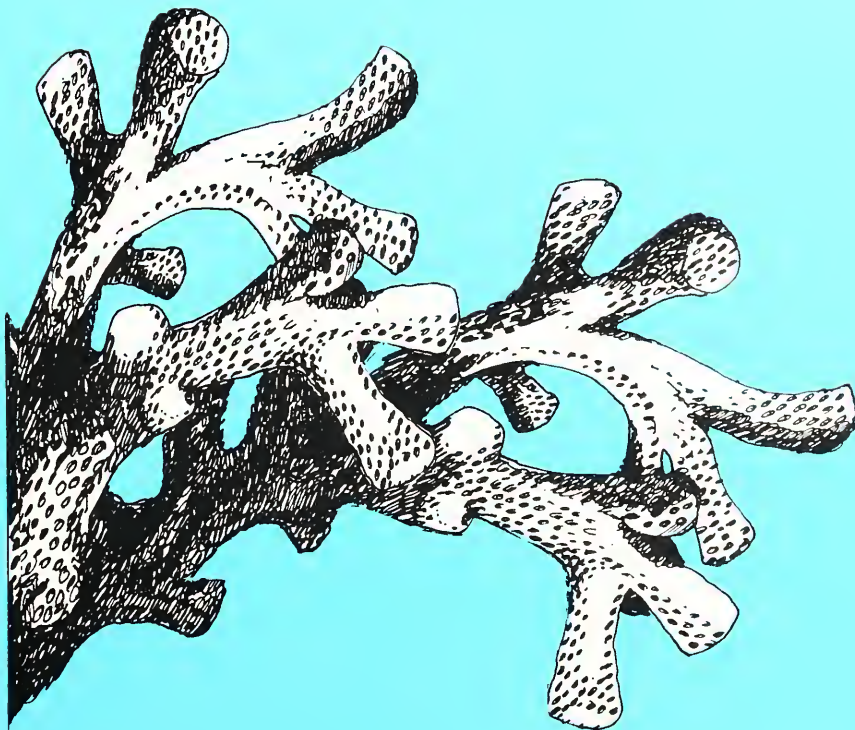
September, 1979



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of Coastal Zone Management

Key Largo Coral Reef Marine Sanctuary Management Plan

September, 1979



U.S. DEPARTMENT OF COMMERCE


Junanita M. Kreps, Secretary

National Oceanic and Atmospheric Administration

Richard A. Frank, Administrator

Office of Coastal Zone Management
Robert W. Knecht, Assistant Administrator





Digitized by the Internet Archive
in 2012 with funding from
LYRASIS Members and Sloan Foundation

<http://www.archive.org/details/keylargocoralree00nati>

foreword

The reefs at Key Largo are the most extensive coral communities along the continental United States and provide more than 400,000 visitors a year recreational enjoyment.

Because of their unique value, 100 square miles encompassing these coral reefs were designated a Marine Sanctuary in 1975 by the Secretary of Commerce.

This is the first in a series of management plans for our Marine Sanctuaries. It explains the purpose of the Key Largo Coral Reef Marine Sanctuary, describes the coral reef ecosystem we are protecting, details what threatens the resource, and summarizes what the National Oceanic and Atmospheric Administration's Office of Coastal Zone Management plans to do to manage and conserve this national treasure.

Robert W. Knecht
Assistant Administrator

table of contents

SUMMARY	7
INTRODUCTION	9
Marine Sanctuary Purpose and Authority	9
Boundaries	9
Regional Map	11
MARINE SANCTUARY RESOURCES	13
Natural Resources	13
Coral Reefs	13
Hardgrounds	14
Grass Community	14
Natural Resource Map	15
Sand Community	17
Commercially Important Species	17
Cultural Resources	17
Carysfort Reef Lighthouse	17
Shipwrecks	18
Cultural Resource Map	19
Christ of the Deep	21
Carysfort Reef Lighthouse (Illustration)	21
IMPACTS ON THE RESOURCE	22
Human Impact	22
Visitor Use	22
Dredge and Fill Activities	23
Channelization	23
Land Development	23
Water Pollution	23
Diving	24
Fishing	24
Anchoring and Boat Groundings	24
Most Used Areas	24
Visitor Use Map	25
MANAGEMENT PLAN	29
Office of Coastal Zone Management	29
Onsite Manager	29
Enforcement and Surveillance	29
Violation Procedure	29
Research and Permits	30
Education	30
Interagency Cooperation	31
Management Accomplishments	31
Management Goals	32
BIBLIOGRAPHY	34
APPENDICES	40
Legislation	40
Rules and Regulations	44
Memorandum of Understanding	47

summary

This plan describes what is known about the resources in the Key Largo Coral Reef Marine Sanctuary and summarizes the impacts humans have on the resources. It outlines the research needed to answer specific management questions and describes how the resources are being protected through education and enforcement of regulations.

Coral reefs are the most productive and diverse of all the natural marine communities and the reef areas off Key Largo are particularly luxuriant. The Sanctuary contains four distinct biological zones:

- Coral reef areas consisting of reef banks at the seaward edge of the shelf margin and numerous patch reefs on the landward side;
- Hardground areas veneered with hard and soft corals;
- Marine grass areas, which serve as nursery areas for many important organisms;
- Sand areas interspersed with patches of grass or occurring as haloes around patch reefs.

Populations of spiny lobster and stone crabs, which are commercially important, and recreational species such as grouper, snapper, dolphin, and pompano also are found within the Sanctuary. The area contains many structures and objects such as lighthouses, sunken ships, and associated artifacts, and a bronze statue of Christ of the Deep, significant for their cultural value.

South Florida is one of the fastest growing urban areas in the country. It is unclear what effect dredging and filling, channelization, municipal and industrial discharges, and air pollution associated with this growth have had on the marine environment off Key Largo. Nevertheless, the impact of 400,000 visitors a year is visible: broken and overturned corals, discarded beverage containers and fishing line, and scarred patches on grassy areas all attest to improper operation of boats and carelessness on the part of some visitors.

Overall management of the Sanctuary is the responsibility of the NOAA Office of Coastal Zone Management and day-to-day management at the site has been delegated to the Florida Department of Natural Resources.

Protection of the resources cannot be accomplished without effective surveillance of the area and enforcement of the regulations. These functions are accomplished by the Florida Department of Natural Resources and the U.S. Coast Guard. Cases involving violation of the regulations are handled by the NOAA Office of General Counsel through civil proceedings.

Scientific data on the Sanctuary so far has been restricted to basic hydrographic, environmental, and biological studies. Little research to date has been designed to come to grips with specific management problems or to address any long-term environmental questions. During the next 5 years, therefore, NOAA will give the highest priority to conducting field studies, carrying out laboratory projects, and monitoring biological and sociological aspects of the Sanctuary. Such information will increase the understanding of the resources and assess the impact of human pressures on the Sanctuary environment.

Included will be a biological inventory in 1979 and 1980 that will provide baseline data on the distribution, diversity, and abundance of reef organisms. By comparing these data with the results of inventories to be carried out in 1985 and 1990, managers will be able to determine if conditions in the Sanctuary are getting better or worse, and will be able to restructure their management plans if conditions warrant.

In addition, two other crucial studies are scheduled for the Sanctuary: a reef health assessment (also in 1979 and 1980) to estimate the percentage of live coral versus dead coral cover on the reef and document the extent of coral disease and anchor damage; and a water quality assessment (primarily in 1980) to determine if such factors as organic pollutants, nutrients, temperature, salinity, and turbidity are conducive to coral proliferation. In both instances, the information will provide baseline data to which future studies can be compared.

In 1979, NOAA, in cooperation with the Harbor Branch Foundation, will carry out a deep-water survey of the Sanctuary. Approximately half of the Sanctuary lies in waters between 100 and 300 feet (30-90 m). Because previous research in the area has been limited to waters no deeper than 100 feet (30 m), NOAA considers it important to fill this significant gap. The agency will examine in detail, using side scan sonar, a magnetometer, and submarines, a deep water reef discovered in 1973. The survey will gather information on the location of this and other deepwater reefs, their associated organisms, and archaeological resources.

Finally, a series of special studies in 1981, 1984, 1987 will be carried out. These will deal with specific rather than general aspects of the Sanctuary and may include a lobster assessment, coral disease studies, anchor damage studies, cultural research and development, and other special items of interest derived from the results of baseline studies.

To supplement this research, NOAA, in cooperation with the Florida Department of Natural Resources, will monitor, on a monthly basis, permanent stations set up at environmentally different locations. The monitoring will include observation of coral diseases, mortality, growth, and recruitment; measurement of sedimentation, temperature, salinity, and turbidity; assessment of anchor damage, diver damage, or other user-related impacts; photographic documentation of representative coral colonies; and life history observations of other invertebrates in the Sanctuary.

introduction

Southeast of the Florida peninsula, where the Keys begin their extension into the Gulf of Mexico, lies one of nature's oldest and most artfully crafted underwater gardens: the Key Largo Coral Reef Marine Sanctuary. Encompassing 100 square miles (259 square kilometers) of submerged coral architecture, it rivals in structure and color the most variegated natural land formations.

The coral ecosystem that spans the Atlantic side of the Florida Keys is the most extensive living coral reef system in the continental United States. Sculptured over thousands of years, the reef tract at Key Largo has thrived because the Key's continuous land mass provides a natural barrier to pollutants, turbidity, and cold and fresh water.

But the reef is important not only for its breathtaking beauty. The coral acts as a self-repairing breakwater that shelters the land against the violence of ocean storms and hurricanes by dissipating the energy of oncoming waves. It provides food and habitats for much of the marine life that makes the Florida Keys one of the world's finest commercial and sport fishing areas.

The reef corals and calcareous algae are a major source of sand, which is essential for the growth of seagrass meadows that are the habitat for thousands of organisms. The reef also serves as a living laboratory, attracting scientists from all over the world who study and learn about the inhabitants of this world. Finally, the economy of the Keys depends almost entirely on tourism, and the reefs are its backbone, attracting thousands of sightseers, fishermen, and divers every year.

Over the years, the immense popularity of the reefs for recreation, coupled with human-induced changes to the environment, have seriously threatened the corals' existence. Recreation-related activities—dropping anchors on coral, disturbance of the coral by divers, improper use of nets and traps by fishermen, and the collection of coral for personal or commercial purposes—have damaged the coral community. In addition, man's development activities in the Keys and South Florida—dredging, filling, channelization, and pollution—have also contributed to the reef's environmental stress.

Marine Sanctuary Purpose and Authority

In 1972, Congress enacted the Marine Protection, Research and Sanctuaries Act (Public Law 92-532, 16 U.S.C. 1431 *et seq.*, Section 302 [a]). Title III of the Act directs the Secretary of Commerce to designate ocean waters as Marine Sanctuaries for the purpose of preserving or restoring their conservational, recreational, ecological, or esthetic values. The reef system off Key Largo was nominated for Marine Sanctuary status to protect and preserve the coral reef ecosystem in its natural state, regulate uses within the Marine Sanctuary, insure the health and well-being of the coral and associated flora and fauna, and guarantee its continued esthetic and recreational appeal. The Key Largo Coral Reef Marine Sanctuary was designated by the Secretary of Commerce on December 18, 1975. It is adjacent to the John Pennekamp Coral Reef State Park, which was established by Florida in 1961 to insure protection of the reefs in State waters. Regulations are issued under the authorities of Section 302(f), 302(g), and 303 of the Act.

Boundaries

The Marine Sanctuary is less than 60 miles (96 km) from the highly urbanized city of Miami via an overseas highway (U.S. 1) that connects Key West to the Florida mainland (Fig. 1). The Marine Sanctuary is part of the Atlantic Ocean beginning 3 miles (4.8 km) seaward of Key Largo, Fla., and extending out to the 300-foot (92-m) isobath on the continental shelf. It is approximately 20 miles (32 km) in length and varies from 3 to 6 miles (5-9 km) in width.

There are also two other coral preserves that protect the reef ecosystem in this area (Fig. 1). To the west and sharing a common boundary with the Marine Sanctuary, lies John Pennekamp Coral Reef State Park, established in 1961. It protects the waters from Key Largo seaward to the State's 3-mile (4.8 km) territorial limit. North of the Marine Sanctuary lies Biscayne National Monument. It shares part of its boundary with the Marine Sanctuary and not only protects the reef areas offshore but also Elliot Key and part of Biscayne Bay.

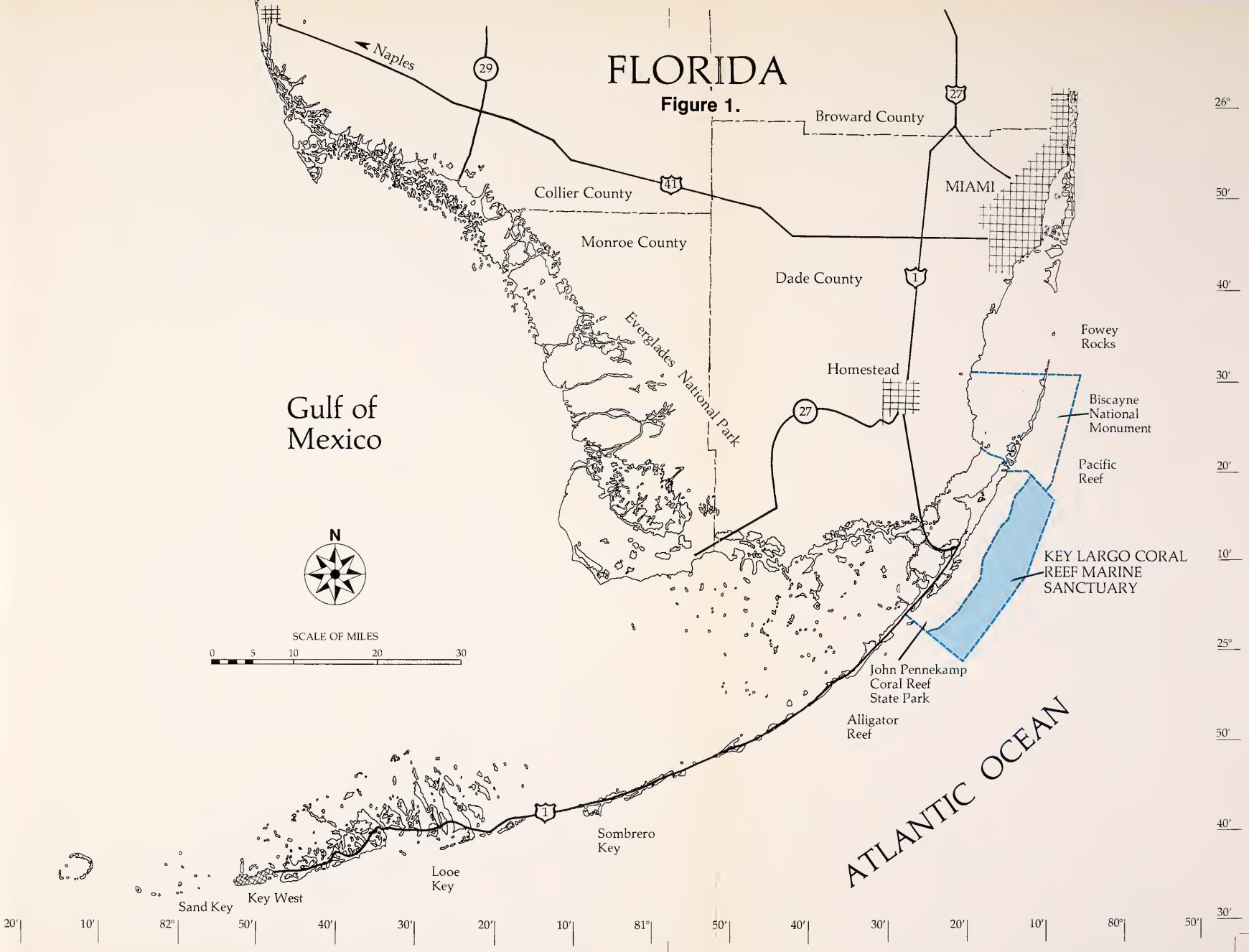
The coordinates for the Marine Sanctuary are as follows: the point of beginning (POB) is 25° (degrees) 19.45' (minutes) north latitude, 80°, 12.0' west longitude, that point being the north-east boundary corner of John Pennekamp Coral Reef State Park. From the POB run southeasterly to 25°, 16.2' north latitude, 80°, 8.7' west longitude, that point also being on the 300-foot (92-m) isobath. Continue in a southwesterly direction to 25°, 7.5' north latitude, 80°, 12.5' west longitude. Again run in a southwesterly direction to 24°, 58.3' north latitude, 80°, 19.8' west longitude. Leaving the 300-foot (92-m) isobath, run northwesterly to 25°, 2.2' north latitude, 80°, 25.25' west longitude, that point being the southeast boundary corner of John Pennekamp Coral Reef State Park. Continue in a northeasterly direction along the easterly boundary of State Park to the POB.

There are also two other coral preserves that protect the reef ecosystem in this area (Fig. 1). To the west and sharing a common boundary with the Marine Sanctuary, lies John Pennekamp Coral Reef State Park, established in 1961. It protects the waters from Key Largo seaward to the State's 3-mile (4.8 km) territorial limit. North of the Marine Sanctuary lies Biscayne National Monument. It shares part of its boundary with the Marine Sanctuary and not only protects the reef areas offshore but also Elliot Key and part of Biscayne Bay.

The coordinates for the Marine Sanctuary are as follows: the point of beginning (POB) is 25° (degrees) 19.45' (minutes) north latitude, 80°, 12.0' west longitude, that point being the north-east boundary corner of John Pennekamp Coral Reef State Park. From the POB run southeasterly to 25°, 16.2' north latitude, 80°, 8.7' west longitude, that point also being on the 300-foot (92-m) isobath. Continue in a southwesterly direction to 25°, 7.5' north latitude, 80°, 12.5' west longitude. Again run in a southwesterly direction to 24°, 58.3' north latitude, 80°, 19.8' west longitude. Leaving the 300-foot (92-m) isobath, run northwesterly to 25°, 2.2' north latitude, 80°, 25.25' west longitude, that point being the southeast boundary corner of John Pennekamp Coral Reef State Park. Continue in a northeasterly direction along the easterly boundary of State Park to the POB.

FLORIDA

Figure 1.



marine sanctuary resources

NATURAL RESOURCES

The plant and animal communities of the Marine Sanctuary are extremely diverse and include at least 35 species of West Indian scleractinian corals and more than 500 species of fishes. A description of these communities can be found in the Key Largo Marine Sanctuary Environmental Impact Statement and in related material listed in the bibliography.

Reef areas are the most biologically productive and diverse of all the natural marine communities. This assemblage of plants and animals has achieved an ecological balance that makes the organisms dependent upon one another for survival. Although corals themselves do not account for the major percentage of the reef biomass, they do create a favorable habitat for thousands of other organisms. When corals are stressed, migration or even death of the organisms that depend on them for survival can quickly follow. To illustrate the spatial relationship of different communities to one other, a resource map of the Marine Sanctuary has been developed (Fig. 2). In this plan, four areas are considered: coral reefs, hardgrounds, grass communities, and sand communities.

Coral Reefs

Coral reef areas are those communities that show active vertical and lateral growth with associated dead coral still in a growth position. As they die, the corals' hard skeletons accumulate and actively contribute to topographical development of the reef. In Marine Sanctuary waters, bank reefs and numerous patch reefs form the foundation for these reef communities.

The coral reef areas in the Marine Sanctuary are particularly luxuriant. This seems to be the result of open ocean circulation with warm, clear Florida Current waters and the absence of colder, turbid, less saline Florida Bay waters. The continuous landmass of Key Largo restricts mixing of bay and ocean waters and tends to keep the environment of the reefs stable.

Bank reefs occur very near the shallow shelf break or at the seaward edge of the shelf margin. Generally bank reefs show spur and groove development and include areas such as Molasses, French, Elbow, and Carysfort reefs. Some are found 2 to 3 miles (3.2-4.8 km) landward of the reef front in areas where water shoals rapidly. Grecian Rocks, Key Largo, Dry Rocks, and Turtle Reef are typical examples. A common environmental characteristic of bank reefs is open circulation and relatively high current energy conditions, where temperature and salinity are more stable. There are approximately 14 miles (22 km) of bank reefs within Marine Sanctuary boundaries. Reef height is usually much less than 25 feet (7.6 m) and typically on the order of 10 to 15 feet (3-4.5 m). The areas are highly diversified with many showing distinct zonation. *Acropora palmata* (moosehorn or elkhorn coral) is a massive, branching scleractinian coral that is the chief builder of bank reefs. Because of its form it is able to withstand strong currents and is an indicator of open circulation. Its optimum depth range is from the surface to 25 feet (7.6 m).

In less turbulent areas behind *A. palmata*, thickets of *A. cervicornis* (staghorn) and *Porites porites* (club-finger) corals are found in varying abundances. These forms indicate back reef zones with less turbulent energy conditions. In certain areas, the zonation continues and massive head corals exist. These corals tend to grow in shallow sheltered parts of bank reefs and in deeper areas in front of the reef slope. Their bases can be extensively undercut by boring sponges, worms, and mollusks, and as they grow they can become top-heavy, making them especially vulnerable to wave action. *Montastrea annularis* (star coral) is the most abundant head coral in bank reefs within the Marine Sanctuary. Other head corals include the brain corals *Diploria strigosa*, *D. labyrinthiformis*, *Colpophyllia natans* and the other star corals *M. carver-nosa* and *Siderastrea siderea*.

Less abundant hard corals grow among the framework of bank corals and include *Agaricia agaricites*, *Porites astreoides*, *Mycetophyllia lamarackiana*, *Colpophyllia* spp., *Dichocoenia stokesi*, *Eusmilia fastigiata*, *Meandrina meandrites*, and *Mussa angulosa*. The hydroid *Millepora complanata* (fire coral) is important on certain bank reefs. It secretes a hard calcareous skeleton and requires a hard substrate for growth. Sponges, sea fans, and other invertebrates are important components of the coral reef ecosystem and are quite varied throughout reef areas of the Marine Sanctuary. The associated fish life is also abundant and diverse.

In quiet areas behind bank reefs, numerous patch reefs are found landward of the reef front in areas of sand and rock substrates. They occur as single dome-shaped patches or cluster linearly along a submerged topographical trend. Patch reefs are generally surrounded by sand haloes, areas of bare sediment thought to be the result of grazing by reef animals. Supporting a varied assemblage of scleractinian and octocorals (soft corals), they tend to be less well zoned than bank reefs, lack *A. palmata*, and sustain smaller amounts of *A. cervicornis*. Many patch reefs consist entirely of huge colonies of *M. annularis*. Their height is seldom greater than 30 feet (9.1 m) and normally 10 to 15 feet (3-4.5 m). Like bank reefs, patch reefs are very diverse areas and support algae, sponges, and numerous other invertebrates, including varying amounts of encrusting corals.

Hardgrounds

Another important community that has a wider distribution than the coral reef areas are the hardgrounds. These are bedrock areas veneered by encrusting and small head corals, numerous octocorals, and their associated communities. Corals here are lamellate encrustations and small knobs of coral less than 3 feet (0.9 m) in diameter. Hardgrounds differ from coral reef areas in that they occur on a substrate that was not formed from the recent reproduction and growth of their associated fauna. Vertical growth is not extensive. Associated corals include *S. siderea*, *Favia fragum*, *Solenastrea hyades*, *P. astreoides*, *D. clivosa*, *D. stokesi*, and varying amounts of other species indigenous to Florida's marine waters. Inshore hardgrounds contain higher percentages of octocorals than reef areas and include various sponges, especially *Hippospongia gossypina*, *H. lachne*, *Spongia barbara*, *S. chiris*, *S. graminia* and *Spheciospongia vesparia* (loggerhead sponge). Since there are fewer crevices and holes than in the framework of coral reef communities, associated invertebrate and fish life is usually less diverse than in reef areas. Exact parallels between hardground areas are difficult because richness and diversity from one hardground area to the next are highly variable and no single set of organisms can be attributed to a hardground community.

Grass Community

A major portion of the Marine Sanctuary consists of marine grasses and associated organisms. There are approximately six species of marine grasses in Florida waters with two dominant in the Marine Sanctuary. *Thalassia testudium* (turtle grass) is by far the most common and is found whenever the sediment is sufficiently thick and stable for the grass to develop its root system, which may penetrate the bottom 18 inches (45 cm) or more. *Syringodium filiforme* (manatee grass) grows in deeper parts of the shelf and is mixed with *T. testudium* or found forming sparse zones of its own. Grass areas vary from very dense mats to areas with sparse cover, heavily interspersed with polychaetes and burrowing shrimp. To the casual observer the organisms of the grass community seem few, but close examination reveals otherwise. Attached to the blades are many types of epiphytic (nonparasitic) organisms, including filamentous algae, diatoms, foraminifera, and bivalve and gastropod mollusks. Grass areas serve as a nursery ground for commercial shrimp, crawfish, and fishes. The grass blades themselves act like a sediment trap and, along with their rhizome root system, assist in maintaining water clarity. Associated with the grass beds are numerous green algae such as *Penicillus* and *Halimeda*. The main marine grass herbivores are sea urchins, parrot fishes, and sea turtles.

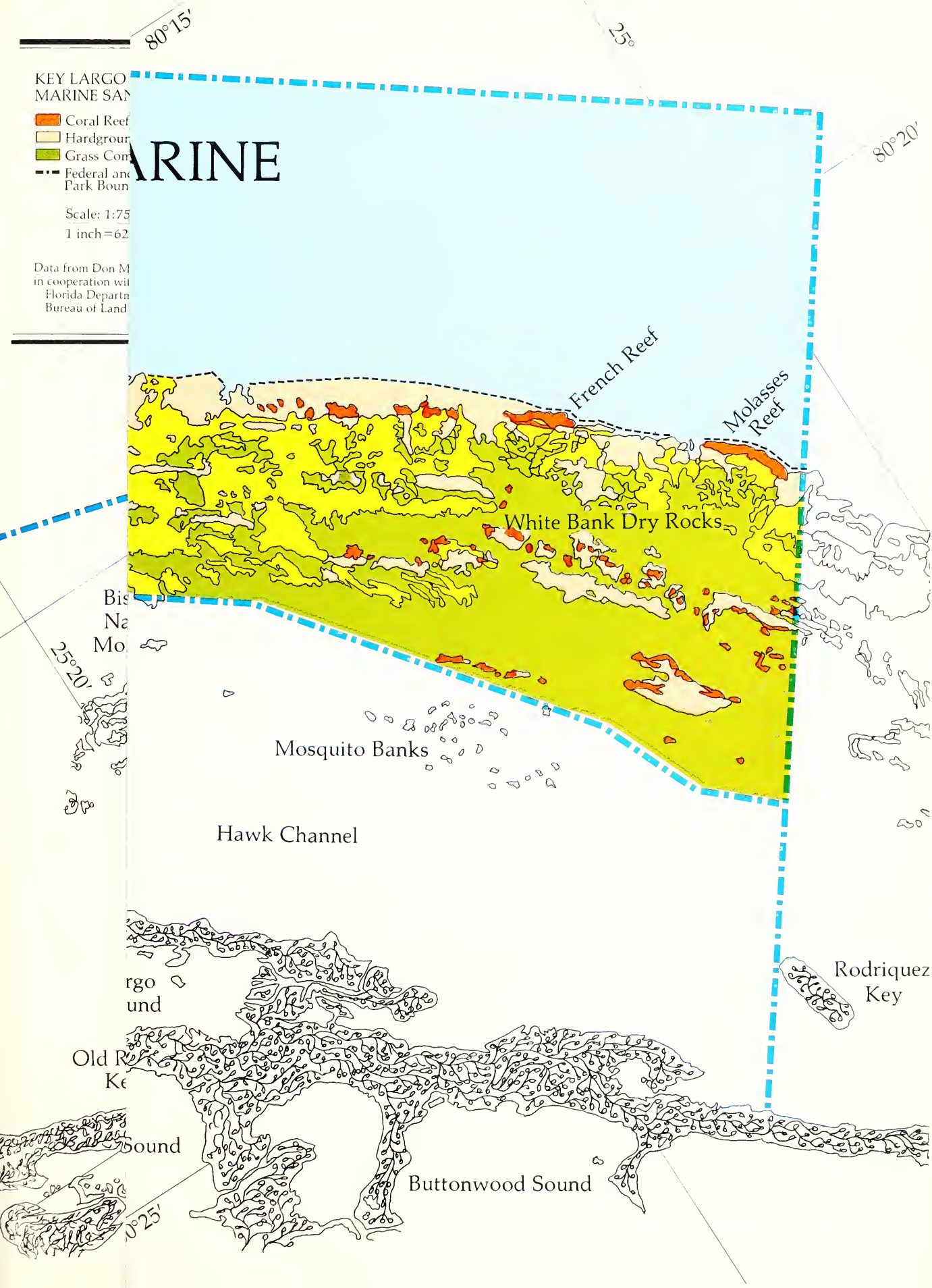
KEY LARGO
MARINE SAN

- Coral Reef
- Hardground
- Grass Com
- Federal and
Park Bound

Scale: 1:75
1 inch = 62

Data from Don M
in cooperation with
Florida Departm
Bureau of Land

MARINE



Less abundant hard corals grow among the framework of bank corals and include *Agaricia agaricites*, *Porites astreoides*, *Mycetophyllia lamarackiana*, *Colpophyllia* spp., *Dichocoenia stokesi*, *Eusmilia fastigiata*, *Meandrina meandrites*, and *Mussa angulosa*. The hydroid *Millepora complanata* (fire corall) is important on certain bank reefs. It secretes a hard calcareous skeleton and requires a hard substrate for growth. Sponges, sea fans, and other invertebrates are important components of the coral reef ecosystem and are quite varied throughout reef areas of the Marine Sanctuary. The associated fish life is also abundant and diverse.

In quiet areas behind bank reefs, numerous patch reefs are found landward of the reef front in areas of sand and rock substrates. They occur as single dome-shaped patches or cluster linearly along a submerged topographical trend. Patch reefs are generally surrounded by sand haloes, areas of bare sediment thought to be the result of grazing by reef animals. Supporting a varied assemblage of scleractinian and octocorals (soft corals), they tend to be less well zoned than bank reefs, lack *A. palmata*, and sustain smaller amounts of *A. cervicornis*. Many patch reefs consist entirely of huge colonies of *M. annularis*. Their height is seldom greater than 30 feet (9.1 m) and normally 10 to 15 feet (3-4.5 m). Like bank reefs, patch reefs are very diverse areas and support algae, sponges, and numerous other invertebrates, including varying amounts of encrusting corals.

Hardgrounds

Another important community that has a wider distribution than the coral reef areas are the hardgrounds. These are bedrock areas veneered by encrusting and small head corals, numerous octocorals, and their associated communities. Corals here are lamellate encrustations and small knobs of coral less than 3 feet (0.9 m) in diameter. Hardgrounds differ from coral reef areas in that they occur on a substrate that was not formed from the recent reproduction and growth of their associated fauna. Vertical growth is not extensive. Associated corals include *S. siderea*, *Favia fragum*, *Solenastrea hyades*, *P. astreoides*, *D. clivosa*, *D. stokesi*, and varying amounts of other species indigenous to Florida's marine waters. Inshore hardgrounds contain higher percentages of octocorals than reef areas and include various sponges, especially *Hippospongia gossypina*, *H. lachne*, *Spongia barbara*, *S. chiris*, *S. graminia* and *Spheciospongia vesparia* (loggerhead sponge). Since there are fewer crevices and holes than in the framework of coral reef communities, associated invertebrate and fish life is usually less diverse than in reef areas. Exact parallels between hardground areas are difficult because richness and diversity from one hardground area to the next are highly variable and no single set of organisms can be attributed to a hardground community.

Grass Community

A major portion of the Marine Sanctuary consists of marine grasses and associated organisms. There are approximately six species of marine grasses in Florida waters with two dominant in the Marine Sanctuary. *Thalassia testudium* (turtle grass) is by far the most common and is found whenever the sediment is sufficiently thick and stable for the grass to develop its root system, which may penetrate the bottom 18 inches (45 cm) or more. *Syringodium filiforme* (manatee grass) grows in deeper parts of the shelf and is mixed with *T. testudium* or found forming sparse zones of its own. Grass areas vary from very dense mats to areas with sparse cover, heavily interspersed with polychaetes and burrowing shrimp. To the casual observer the organisms of the grass community seem few, but close examination reveals otherwise. Attached to the blades are many types of epiphytic (nonparasitic) organisms, including filamentous algae, diatoms, foraminifera, and bivalve and gastropod mollusks. Grass areas serve as a nursery ground for commercial shrimp, crawfish, and fishes. The grass blades themselves act like a sediment trap and, along with their rhizome root system, assist in maintaining water clarity. Associated with the grass beds are numerous green algae such as *Penicillus* and *Halimeda*. The main marine grass herbivores are sea urchins, parrot fishes, and sea turtles.

KEY LARGO CORAL REEF
MARINE SANCTUARY — 1978

- Coral Reef
- Sand Community
- Hardground
- Water
- Grass Community
- Mangrove
- Federal and State Park Boundaries
- Limit of Survey

Scale: 1:75,000

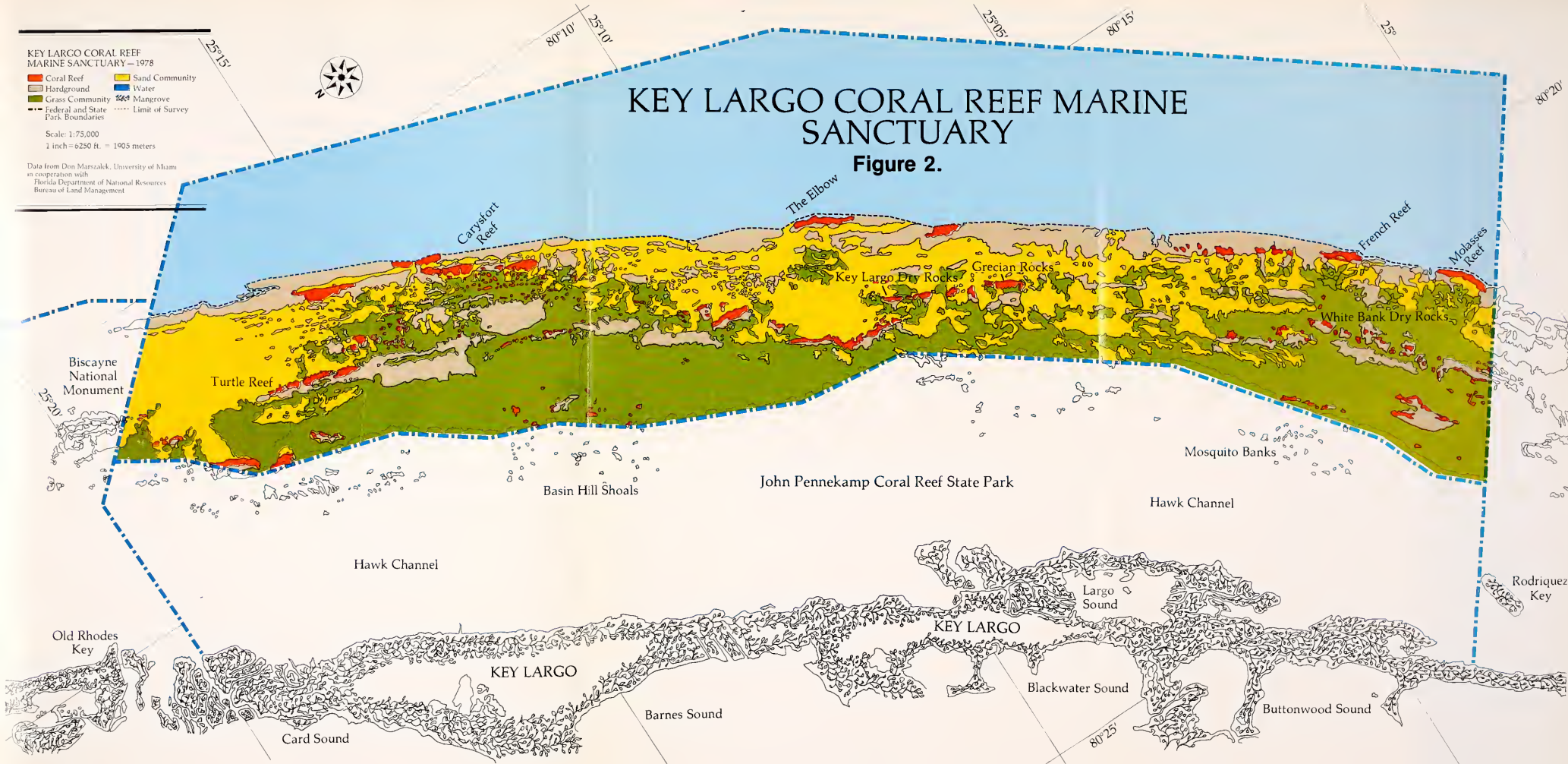
1 inch = 6250 ft. = 1905 meters

Data from Don Marszalek, University of Miami
in cooperation with
Florida Department of Natural Resources
Bureau of Land Management



KEY LARGO CORAL REEF MARINE SANCTUARY

Figure 2.



Sand Community

Sand (sediment) areas within the Marine Sanctuary take several forms and are ecologically the least diverse of the areas discussed. They range from larger sand bodies a few miles wide to small isolated patches. They are frequently interspersed in grass bed areas or occur as haloes around most patch reefs. The borders between sand and grass zones are usually defined by sharp, undercut boundaries. The sediment is mainly coarse biogenic carbonate sand formed primarily from the breakdown of the green alga *Halimeda* and hard corals. Associated marine life is sparse, with echinoderms and worms predominating. Other burrowing organisms such as fish, shrimp, and mollusks are present in varying degrees. The large mollusks, such as the *Strombus gigas* (queen conch), and *Plearapora gigantea* (horse conch) are now scarce, reflecting high collecting pressure in recent years.

Commercially Important Species

Panulirus argus (spiny lobster) is of prime commercial interest. *P. guttatus* (Guinea or spotted lobster) and *Scyllarides aequinoctialis* (Spanish or slipper lobster) also are found in Florida waters, but their scarcity and small adult size make them uneconomical to harvest commercially. Juvenile specimens of *P. argus* are no more than a few inches in length and are found in grassy areas under rocks and sponges. As they mature, they migrate into deeper water where they live in protected areas under rocks or in holes.

The only crab of commercial importance is *Menippe mercenaria* (stone crab). Juvenile crabs live in shoreline rubble, oyster shells, or are found on pilings. Adults frequent shallow water and normally prefer burrows, especially in transition areas between sand and grass beds.

Hook and line fishing also takes place within the Marine Sanctuary and not only serves as a source of food but of recreation as well. Some of the more important species that are caught are groupers, mackerels, dolphin, snappers, hogfish, tarpon, pompano, jacks, and bonefish. To a great degree the quality of the water column determines the distribution and abundance of these migratory species.

CULTURAL RESOURCES

The cultural resources of the Marine Sanctuary reflect the colorful history of the Florida Keys and surrounding waters (Fig. 3). Stories of Spanish galleons and the pirates who sailed the Keys abound. More than 100 Spanish, British, and American wrecks attest to the treacherous conditions sailors faced in these waters. To help alleviate this danger, a string of lighthouses was built up and down the Florida reef tract and contributed to the demise of the lucrative wrecking and salvage industry that supported Key West until the early 1900's. Today some of this history still lies buried on the ocean floor and draws thousands of visitors to the Keys each year.

Carysfort Reef Lighthouse

The most prominent cultural resource of the Marine Sanctuary is Carysfort Reef Lighthouse (Fig. 4). It was the first lighthouse built by the U.S. Lighthouse Service on the Florida reef tract. Located in the north end of the Sanctuary, it served as a prototype for the other lighthouses in the Florida Keys that were built on severely exposed areas. Construction began in 1848 by Captain Howard Stansburg of the U.S. Topographical Corps of Engineers. Its light was first ignited

on March 10, 1852, replacing a lightship that had been stationed on Carysfort Reef since 1825. Still in excellent condition, it stands as a testimonial to the ingenuity of the engineers of the time. Situated in approximately 6 feet (1.8 m) of water, the lighthouse is an iron skeleton tower on a pile foundation rising 100 feet (32.3 m) above mean low water.

Carysfort lighthouse was originally equipped with a revolving Fresnel lenticular illuminating apparatus which made it the most modern lighthouse of the U.S. Lighthouse Service at that time. Today it is fully automated and maintained by the United States Coast Guard.

Shipwrecks

Tales abound of Spanish galleons and other ships that are thought to have sunk in the Marine Sanctuary. In the mid to late 1600's, the reefs of Florida Keys contributed to the tragic demise of cumbersome Spanish galleons. Poor navigational techniques and lack of understanding of weather patterns caused many ships to meet a violent end on the coral heads that loomed from the ocean floor. The coral reefs grounded many ships through the 1800's, and provided the justification for the Carysfort Reef Lighthouse.

One of the earliest ship disasters was in 1733, when almost the entire fleet of a 21-ship Spanish flotilla was lost off Key Largo. Of these ships, two galleons, *El Infante* and *San Jose y los Amenas*, have been located outside the southern boundary of the Marine Sanctuary. Apparently the fleet was hit by a hurricane while returning to Spain. A hurricane may also have played the dominant role in the grounding of the Plata flotilla fleet of 13 galleons near Carysfort Reef in 1755, although the number of ships lost is unknown and no ship of this fleet has ever been located.

Today several wreck sites exist in the Marine Sanctuary (Fig. 3), providing exciting dives for visitors. One of the best known wrecks is the 60-gun British frigate, *HMS Winchester*. Thrown on the reef by a storm in 1695, the wreck lies in 30 feet (9.1 m) of water 1.5 miles (2.5 km) southeast of Carysfort Reef Lighthouse, in direct line with Elbow Light. The *Winchester* was 44.5 meters long, but is now badly broken and scattered throughout the area. Two of the *Winchester's* cannons recovered by C. M. Brookfield in 1940 are on display at the John Pennekamp Coral Reef State Park headquarters.

Another well-known wreck in the Sanctuary is the *Benwood*, an 87-meter World War II freighter. In 1942, it was torpedoed by a German submarine, and, as the ship headed for shallow water, it was accidentally rammed by a friendly vessel. The hull was subsequently used for bombing practice until it was dynamited and sunk in 50 feet (15.2 m) of water. The maze of steel wreckage is one of the most popular diving spots in the Florida Keys.

Lesser known wrecks also are located in the Sanctuary. The steamer *Towanda*, lost in 1866, can be found just north of Elbow Light. Near Elbow Reef Tower lie the remains of a wooden ship encrusted with corals, seaweeds, and sea fans, in 30 feet (9 m) of water. Heavy wooden beams are half buried but bronze fastening pins are still visible. The original name and nationality of the ship is unknown but local guides call it either "No Name Wreck," "Civil War Wreck," or "Old Wild Wreck."

Ninety feet (27.4 m) due east of Molasses Reef tower lies the schooner *Windlass* (also known as the "Winch Wreck") in 25 feet (7.6 m) of water. Its broken remnants are scattered around the heads and add to the excitement of diving at Molasses Reef.

The schooner *Thiorva* went aground and sank at the north end of Turtle Reef on some unknown date.

In shallow water on White Bank, seaward of Basin Hill Shoals, sits the wreck of the *Charles W. Baird* (also known as "Captain Tom's Wreck"). The hull of this oceangoing barge served as a shelter to wreckers and fishermen until it burned in the 1940's. All that remains is the hull superstructure, heavily encrusted with hard and soft corals and serving as a haven for a myriad of fishes.

Cannons of unknown origin also can be found in the Marine Sanctuary (Fig. 3). Approximately 300 feet (91.4 m) west of the wreck of the *Towanda* (at the Elbow) lies a very old cannon. Its 6 foot (1.8 m) length is encrusted with corals and is reputed to be from a 17th or 18th century Spanish galleon. Another Spanish cannon is located 75 feet (23 m) south of the white buoy at Grecian Rocks.

on March 10, 1852, replacing a lightship that had been stationed on Carysfort Reef since 1825. Still in excellent condition, it stands as a testimonial to the ingenuity of the engineers of the time. Situated in approximately 6 feet (1.8 m) of water, the lighthouse is an iron skeleton tower on a pile foundation rising 100 feet (32.3 m) above mean low water.

Carysfort lighthouse was originally equipped with a revolving Fresnel lenticular illuminating apparatus which made it the most modern lighthouse of the U.S. Lighthouse Service at that time. Today it is fully automated and maintained by the United States Coast Guard.

Shipwrecks

Tales abound of Spanish galleons and other ships that are thought to have sunk in the Marine Sanctuary. In the mid to late 1600's, the reefs of Florida Keys contributed to the tragic demise of cumbersome Spanish galleons. Poor navigational techniques and lack of understanding of weather patterns caused many ships to meet a violent end on the coral heads that loomed from the ocean floor. The coral reefs grounded many ships through the 1800's, and provided the justification for the Carysfort Reef Lighthouse.

One of the earliest ship disasters was in 1733, when almost the entire fleet of a 21-ship Spanish flotilla was lost off Key Largo. Of these ships, two galleons, *El Infante* and *San Jose y los Amenas*, have been located outside the southern boundary of the Marine Sanctuary. Apparently the fleet was hit by a hurricane while returning to Spain. A hurricane may also have played the dominant role in the grounding of the Plata flotilla fleet of 13 galleons near Carysfort Reef in 1755, although the number of ships lost is unknown and no ship of this fleet has ever been located.

Today several wreck sites exist in the Marine Sanctuary (Fig. 3), providing exciting dives for visitors. One of the best known wrecks is the 60-gun British frigate, *HMS Winchester*. Thrown on the reef by a storm in 1695, the wreck lies in 30 feet (9.1 m) of water 1.5 miles (2.5 km) southeast of Carysfort Reef Lighthouse, in direct line with Elbow Light. The *Winchester* was 44.5 meters long, but is now badly broken and scattered throughout the area. Two of the *Winchester's* cannons recovered by C. M. Brookfield in 1940 are on display at the John Pennekamp Coral Reef State Park headquarters.

Another well-known wreck in the Sanctuary is the *Benwood*, an 87-meter World War II freighter. In 1942, it was torpedoed by a German submarine, and, as the ship headed for shallow water, it was accidentally rammed by a friendly vessel. The hull was subsequently used for bombing practice until it was dynamited and sunk in 50 feet (15.2 m) of water. The maze of steel wreckage is one of the most popular diving spots in the Florida Keys.

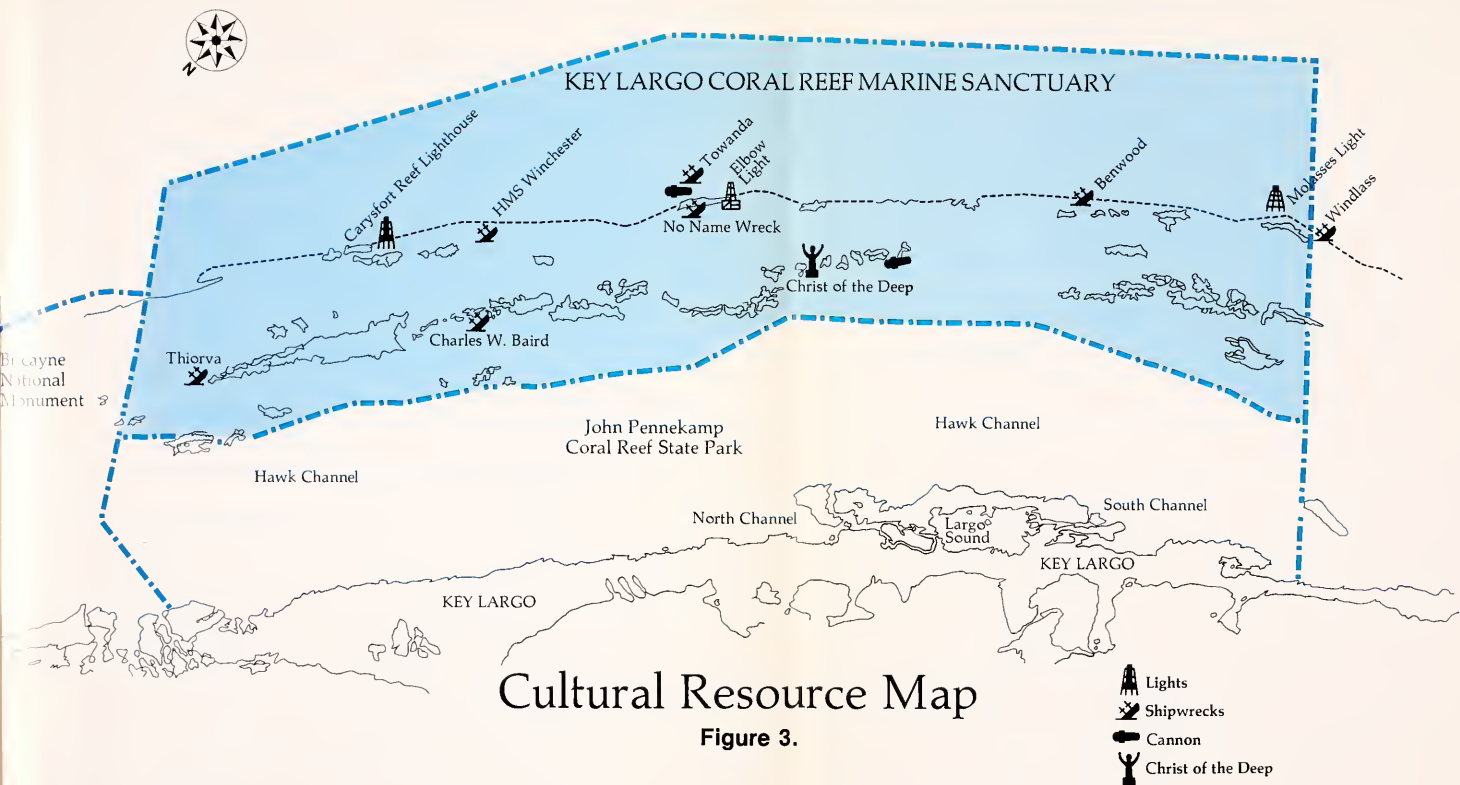
Lesser known wrecks also are located in the Sanctuary. The steamer *Towanda*, lost in 1866, can be found just north of Elbow Light. Near Elbow Reef Tower lie the remains of a wooden ship encrusted with corals, seaweeds, and sea fans, in 30 feet (9 m) of water. Heavy wooden beams are half buried but bronze fastening pins are still visible. The original name and nationality of the ship is unknown but local guides call it either "No Name Wreck," "Civil War Wreck," or "Old Wild Wreck."

Ninety feet (27.4 m) due east of Molasses Reef tower lies the schooner *Windlass* (also known as the "Winch Wreck") in 25 feet (7.6 m) of water. Its broken remnants are scattered around the heads and add to the excitement of diving at Molasses Reef.

The schooner *Thiorva* went aground and sank at the north end of Turtle Reef on some unknown date.

In shallow water on White Bank, seaward of Basin Hill Shoals, sits the wreck of the *Charles W. Baird* (also known as "Captain Tom's Wreck"). The hull of this oceangoing barge served as a shelter to wreckers and fishermen until it burned in the 1940's. All that remains is the hull superstructure, heavily encrusted with hard and soft corals and serving as a haven for a myriad of fishes.

Cannons of unknown origin also can be found in the Marine Sanctuary (Fig. 3). Approximately 300 feet (91.4 m) west of the wreck of the *Towanda* (at the Elbow) lies a very old cannon. Its 6 foot (1.8 m) length is encrusted with corals and is reputed to be from a 17th or 18th century Spanish galleon. Another Spanish cannon is located 75 feet (23 m) south of the white buoy at Grecian Rocks.



Christ of the Deep

A unique aspect of the Sanctuary that draws thousands of visitors annually is the 9 foot (2.7 m) bronze statue, the Christ of the Deep. It is at Key Largo Dry Rocks standing in approximately 25 feet (7.6 m) of water, 6 miles (9.6 km) east-northeast of the south cut of Largo Sound. Marked by an orange and white surface buoy, the 4,000-lb. (1,800 kg) statue rests upon a 21-ton (19-t) concrete base. The statue was created by Guido Galletti of Italy, an exact replica of the Christ of the Abysses statue placed in 50 feet (15 m) of water in the Mediterranean Sea near Genoa in 1954. Duplicated for Egidi Cressi, an internationally known industrialist and undersea sportsman, it was donated to the Undersea Society of America in 1961 and placed at the Key Largo Dry Rocks by the Florida Park Service for diving enthusiasts to enjoy.

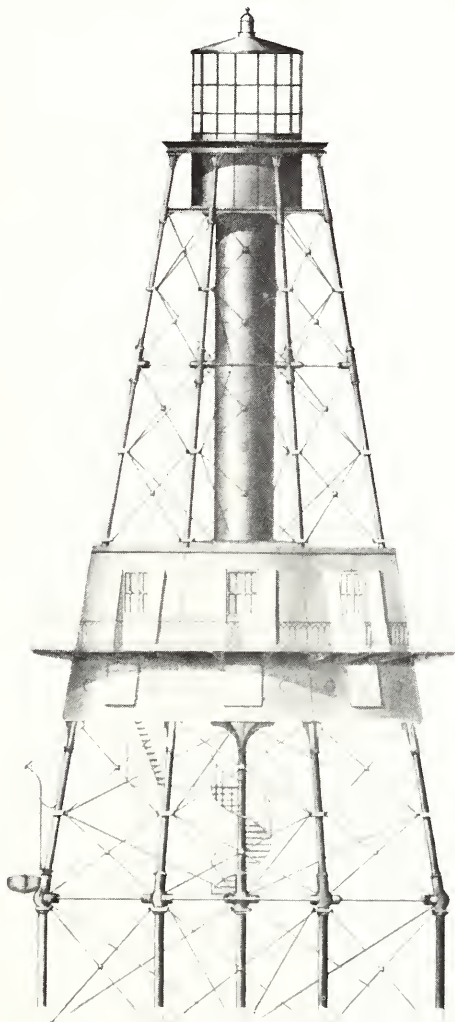


Figure 4.

impacts on the resource

Florida's reefs exist at the northernmost fringe of coral reef development and are subjected to natural stresses far in excess of other Caribbean reefs. Yet they have survived thousands of years of attack by natural enemies and buffeting from storms and hurricanes, and their structures have helped build part of the State of Florida.

Reef-building corals flourish only in an environment governed by narrow constraints. They seldom occur more than 22 degrees north or south of the equator and must have clear water for maximum light penetration. As a result, they are rarely found at depths exceeding 200 to 250 feet (60-90 m). They cannot withstand long exposure to water temperatures colder than 68°F (20°C), are seldom found on soft or shifting bottom sediments or in constantly turbid water with dim light, and cannot tolerate great changes in salinity, temperature, or water quality.

In Florida, the Keys protect the reefs just as the reefs protect the land. The most luxuriant reefs are located opposite large islands which shelter them from wider fluctuations in water temperature and salinity due to storm water runoff from the mainland. Reefs do not exist opposite the large openings between islands where there are no protective barriers.

HUMAN IMPACT

Given this narrow range of environmental constraints, human activities can bring about sufficient additional stress to have both long- and short-term effects on the health of coral communities.

Attracted by pleasant weather and water conditions, vacationers from northern Florida and many other States visit the Keys each year. Winter visitors are primarily from the northern States and Canada. The influx of out-of-State visitors is highest during late spring to early fall, typically the most pleasant months in South Florida. Summer visitation also seems to be on the increase, reflecting use by visitors who want to take advantage of cheaper summer rates and summer vacations.

Visitor Use

People who use the Marine Sanctuary are naturally those individuals who work and play in the marine environment. Since the Marine Sanctuary begins 3 miles offshore, visitors must have access to privately owned boats or to some type of marine transportation. The Florida Department of Natural Resources reported in 1974 that approximately 54,000 boats were registered in the three southern Florida counties (Dade 32,000; Broward 17,000; Monroe 4,800). In 1976, there were 36,000 registered boats in Dade County alone—almost an 11 percent increase in 2 years, a trend that is expected to continue. There are 34 boat ramps and 22 marinas (Fig. 5) available for public use on Key Largo that permit easy access to Marine Sanctuary waters.

Some boat owners use the ramps as far north as Bayfront Park, Homestead, Fla., to visit the Marine Sanctuary and a few even travel from docks and marinas around Miami. There are two small airports as well as public campsites in the Key Largo area. Boat owners use the Marine Sanctuary waters for a variety of purposes. Some come to swim in clear waters and enjoy the sunny weather or to water-ski on calmer days. Others don snorkel or scuba equipment to explore the coral reefs and wrecks. Many visitors use hook and line for recreational fishing. Finally, there are sailboat owners who frequent all South Florida waters enjoying breezes and sunny weather.

Visitors who do not own boats are served by numerous facilities where boat and guide rentals are available. The 13 dive shops on Key Largo (Fig. 5) rent snorkel and scuba gear and provide guides for daily reef trips aboard about 22 dive boats. There are small and large fishing boat charters available that also make two trips a day. The John Pennekamp Coral Reef State Park is equipped with a large boat ramp, an 8,000-lb. (3,600-kg) capacity boat hoist, and a small marina. One vessel with a capacity of 61 people, makes two trips a day taking snorkelers to the reefs. A dive boat at the State Park concession takes as many as 32 scuba divers to the reefs daily. A glass-bottomed boat makes three trips to Molasses Reef every day carrying 125 non-divers each trip.

Commercial fishermen harvest spiny lobster and stone crab from Sanctuary waters using wooden traps, but annual catch statistics are not available for these fisheries. The following sections summarize the activities having the greatest effect on the health of coral reefs.

Dredge and Fill Activities

Chronic siltation from dredge and fill projects can inhibit coral community growth. An increase in turbidity reduces the amount of light available for photosynthesis of symbiotic zooxanthella algae associated with reef building corals. Excess sediment in the water can physically smother the coral polyps and communities and can reduce the dissolved oxygen concentration when organic materials are present.

Channelization

Channelization of land areas, in addition to increased sedimentation effects, also will increase stresses on the coral reef communities by altering current patterns and creating changes in water quality. It is generally believed that luxuriant coral growth off Key Largo results from the land mass serving as a natural barrier to the movement of Florida Bay waters over the reef area. The temperature, salinity, and turbidity of these bay waters is variable enough to lie outside the coral's optimum requirements for survival and growth. Channelization through Key Largo would permit bay water to mix with more stable ocean waters, possibly changing the chemical and physical characteristics of the water and the existing current patterns through natural tidal passes.

Land Development

Development of shorelines by bulkheading and land filling increases the turbidity of adjacent waters and removes the mangroves, whose presence serves as a biological filter of land runoff and contributes to the nutrient enrichment of surrounding waters.

Water Pollution

Decreases in water quality that can lead to further resource damage include sewage disposal, agricultural and industrial waste runoff, and oil pollution. In 1975, the greater Miami area pumped 84 million gallons of sewage a day into surrounding marine waters. Although the effects of inshore currents, counter-currents, and tides in the area are not fully understood, ecologists believe that much of this polluted water travels southward to the Keys. The problem is compounded by the existence of three outfalls in the Key Largo area. The ocean outfall at Plantation Key, just south of Key Largo, pumps 700,000 gallons of secondary treated sewage a day. There are also two outfalls that dump sewage into the water of Largo Sound, Key Largo. In addition to its direct effect of killing live coral, sewage can affect reproduction rates, inhibit the ability of coral larvae to settle, decrease dissolved oxygen content, and increase turbidity.

Agricultural and industrial growth in South Florida in recent years has caused the introduction of insecticides, herbicides, and other industrial chemicals into nearby bodies of water. Introduction of chemical pollutants is especially heavy during periods of heavy rain and excessive

runoff. Aerial spraying for mosquito control occurs throughout the Keys. Evidence of oil pollution from vessel traffic through Hawk Channel and off the Marine Sanctuary increases yearly and may have some as yet unknown impact on the coral reefs.

Diving

Corals are delicate structures and are vulnerable to abuse from divers. If a coral reef is under significant natural or human-induced stress, even a small scrape from divers rubbing or standing on corals is enough to cause terminal infection of the coral by blue-green algae. In many cases, delicate coral branches are broken with fin kicks, by divers standing on corals, and by divers grabbing coral for support. Octocorals are frequently ripped from their foundations and found lying on the bottom. Heavily used areas are especially vulnerable to extensive damage by divers.

Although it is illegal, the collecting of Marine Sanctuary resources still occurs. The majority of this collection is of coral and mollusk shells taken as souvenirs of the coral reef. Cultural resources are not exempt either, and many artifacts disappear from Marine Sanctuary waters.

Fishing

Although Sanctuary regulations prohibit spearfishing, some still occurs. The unfortunate effects of spearfishing include the indiscriminate killing of tropical species, like angelfish and butterfly fish, and the disappearance of larger game fish from the area. Although not as extensive as in previous years, illegal tropical fish collecting for sale and home aquarium use still takes place.

Besides these dramatic threats to the resource there are the less obvious threats that detract from the esthetic quality of Marine Sanctuary waters. Beverage containers, "flip-tops," fishing hooks, stainless steel lead wire, and monofilament fishing line can be found littering the ocean bottom in many areas. Commercial fishing contributes to the Sanctuary's degradation by the addition of abandoned or destroyed traps, with their lines and buoys.

Anchoring and Boat Groundings

Divers and fisherman alike damage the coral reef by repeated anchorings and boat groundings. Many inexperienced boat operators anchor on top of thriving coral areas unaware of the damage they cause below. With shifting winds and tides, coral branches can be broken and entire colonies uprooted as the boat changes position. Chafing of coral heads by anchor chains and ropes is also common.

A less frequent threat, but no less damaging, is boat groundings. A large area of coral and associated fauna can be gouged out by a single boat hull. More common is damage from propellers, which slice through shallow head corals, leaving the animals vulnerable to disease.

MOST USED AREAS

Although the Marine Sanctuary encompasses 100 square miles (259 km²), only a few selected areas receive heavy visitor use. Urbanization of Key Largo has been concentrated at the middle and southern portion of the Key. Dive shops and boat ramps also are located there, focusing heavy visitor use on the corresponding southern end of the Marine Sanctuary. As can be seen

runoff. Aerial spraying for mosquito control occurs throughout the Keys. Evidence of oil pollution from vessel traffic through Hawk Channel and off the Marine Sanctuary increases yearly and may have some as yet unknown impact on the coral reefs.

Diving

Corals are delicate structures and are vulnerable to abuse from divers. If a coral reef is under significant natural or human-induced stress, even a small scrape from divers rubbing or standing on corals is enough to cause terminal infection of the coral by blue-green algae. In many cases, delicate coral branches are broken with fin kicks, by divers standing on corals, and by divers grabbing coral for support. Octocorals are frequently ripped from their foundations and found lying on the bottom. Heavily used areas are especially vulnerable to extensive damage by divers.

Although it is illegal, the collecting of Marine Sanctuary resources still occurs. The majority of this collection is of coral and mollusk shells taken as souvenirs of the coral reef. Cultural resources are not exempt either, and many artifacts disappear from Marine Sanctuary waters.

Fishing

Although Sanctuary regulations prohibit spearfishing, some still occurs. The unfortunate effects of spearfishing include the indiscriminate killing of tropical species, like angelfish and butterfly fish, and the disappearance of larger game fish from the area. Although not as extensive as in previous years, illegal tropical fish collecting for sale and home aquarium use still takes place.

Besides these dramatic threats to the resource there are the less obvious threats that detract from the esthetic quality of Marine Sanctuary waters. Beverage containers, "flip-tops," fishing hooks, stainless steel lead wire, and monofilament fishing line can be found littering the ocean bottom in many areas. Commercial fishing contributes to the Sanctuary's degradation by the addition of abandoned or destroyed traps, with their lines and buoys.

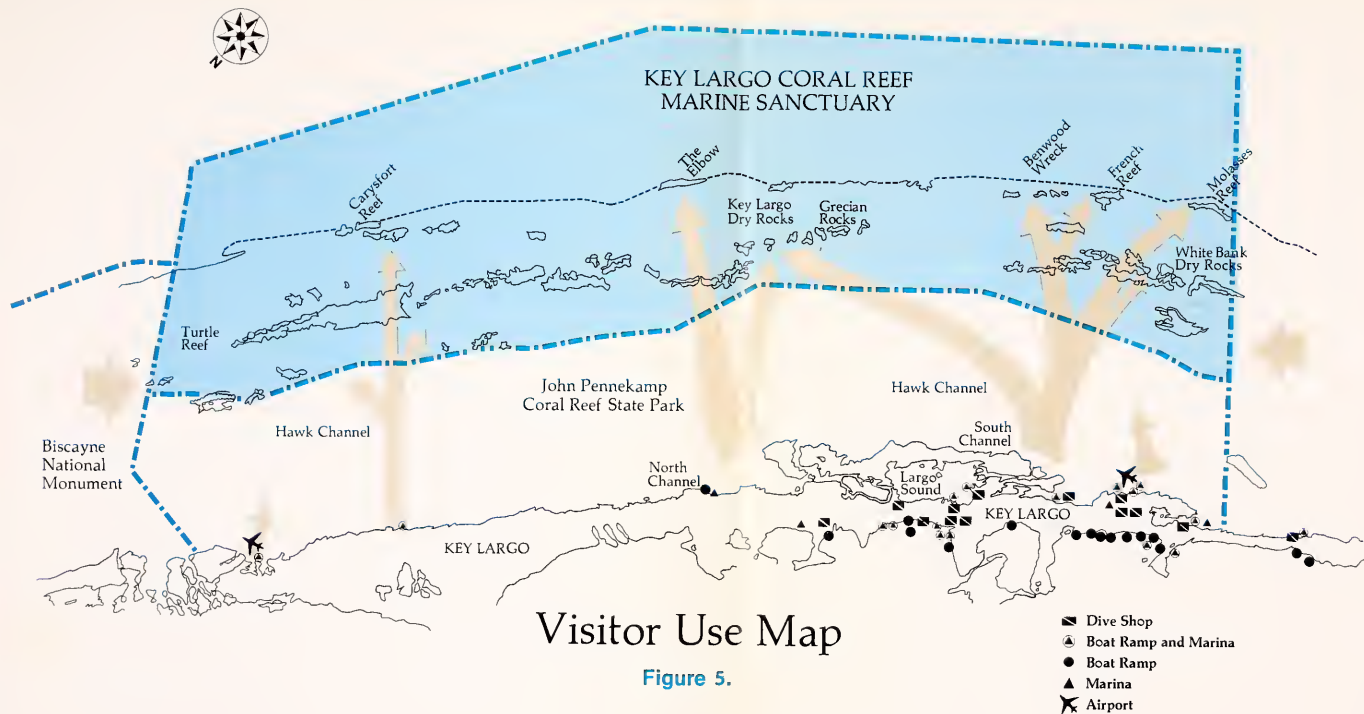
Anchoring and Boat Groundings

Divers and fisherman alike damage the coral reef by repeated anchorings and boat groundings. Many inexperienced boat operators anchor on top of thriving coral areas unaware of the damage they cause below. With shifting winds and tides, coral branches can be broken and entire colonies uprooted as the boat changes position. Chafing of coral heads by anchor chains and ropes is also common.

A less frequent threat, but no less damaging, is boat groundings. A large area of coral and associated fauna can be gouged out by a single boat hull. More common is damage from propellers, which slice through shallow head corals, leaving the animals vulnerable to disease.

MOST USED AREAS

Although the Marine Sanctuary encompasses 100 square miles (259 km²), only a few selected areas receive heavy visitor use. Urbanization of Key Largo has been concentrated at the middle and southern portion of the Key. Dive shops and boat ramps also are located there, focusing heavy visitor use on the corresponding southern end of the Marine Sanctuary. As can be seen



on the visitor use map (Fig. 5), the majority of access routes are located to the south. Major reef areas are charted on NOAA's navigational charts for the area, but very few areas within the Marine Sanctuary are marked with towers or buoys, which has the effect of intensifying the use of areas that do have buoy markers. Because of this, some reefs get a greater amount of use than others. Unmarked areas are visited primarily by local dive shop tours and fishing boat captains, along with a few knowledgeable local people. The more intensively used areas are described in the following sections.

Molasses Reef

This bank reef is located 5 miles (8.4 km) south of the last marker at South Channel leading from Largo Sound and the dock facilities of John Pennekamp Coral Reef State Park. Molasses Reef is one of the most heavily used areas in the Florida Keys. It is not uncommon to find 20 to 30 small boats anchored at the reef during any given time on summer weekends. Most local dive boat operators take their patrons for at least one dive in this area each day, and the glass bottom tour boat, the *Discovery*, makes three daily trips to Molasses Reef. It is popular because of its spectacular reef formation and is marked by a 50-foot (15-m) tower. There are abundant brain, staghorn, and elkhorn corals and wreckage of a schooner nearby. Water visibility is usually excellent, making it an area well suited to underwater photography and to night diving.

White Bank Dry Rocks

White Bank Dry Rocks is a patch reef approximately 0.2 miles (320 m) northeast of the light at Molasses Reef. Because of its shallow depths of 3 to 10 feet (0.9-3.1 m) and its attractive head coral formations, this large area is exceptionally good for snorkeling and draws many neophyte divers. The area is marked with a small buoy.

French Reef

French Reef, 1 mile (1.6 km) northeast of Molasses Reef, is a bank reef marked by a black piling with water depth averaging 25 feet (7.6 m). This area contains actively growing corals in a maze of underwater canyons, caves, and tunnels. Local divers and a few dive shop captains make periodic trips to French Reef to view larger pelagic fish that can often be found there.

Benwood Wreck

This World War II wreck is 2.5 miles (4 km) north-northeast of French Reef resting on a sand bottom, in 30 to 50 feet (9.1-15.2 m) of water, it is usually marked by a red buoy. The area is heavily visited and is advertised as the most exciting wreck dive in the Florida Keys.

Grecian Rocks

A small inner bank reef area, Grecian Rocks, is found 5.5 miles (8.9 km) east-northeast of South Channel, Key Largo, and is marked by a white buoy. This is another popular snorkeling area with depths as shallow as 6 feet (1.8 m), drawing people with limited diving experience. Large corals and a Spanish cannon can be seen here.

Key Largo Dry Rocks

Along with Molasses Reef, this inner bank reef is one of the most visited areas in the Marine Sanctuary. Six miles (9.6 km) east-northeast of South Channel, Key Largo, it is identified by a small orange and white buoy with the word "Statue" on it. In addition to huge brain coral formations, the site also has the Christ of the Deep statue.

The Elbow

The Elbow is a bank reef 8 miles (12.9 km) east-northeast of South Channel, Key Largo, and 5 miles (8 km) southwest of Carysfort Reef Lighthouse. It is marked by a 36-foot (11 m) steel tower and is usually visited by local divers who come to explore and photograph scattered wreckage southeast of the tower. Since it is several miles from the nearest boat ramp, the area is used less frequently by out-of-town visitors and most local dive shops.

Carysfort Reef

This highly developed bank reef lies 12 miles (19 km) northeast of South Channel, Key Largo, and 5 miles (8 km) north-northeast of the Elbow. Marked by a 106-foot (37.3-m) iron lighthouse, this reef is named after the *HMS Carysfort* which grounded at the site in 1770. Staghorn and elkhorn corals are the chief reef builders and are quite luxuriant. Average depths range from 10 to 25 feet (3.1-7.6 m), and it is an excellent area for both scuba diving and snorkeling. Local divers in small boats are the primary users of the area; however, development of the Worlds Beyond Marina directly landward of Carysfort Reef on Key Largo has increased the use of the area by commercial dive boats.

management plan

Management of the Marine Sanctuary is designed to provide the protection necessary to preserve the coral reef ecosystem in its natural state. By integrating education, environmental monitoring, and enforcement of the regulations into a coordinated management strategy, the plan will allow the public to derive maximum benefit from the Marine Sanctuary while the Sanctuary itself will receive a minimum of environmental damage.

OFFICE OF COASTAL ZONE MANAGEMENT

The Office of Coastal Zone Management (OCZM), National Oceanic and Atmospheric Administration (NOAA), is responsible for the management of the Marine Sanctuary. NOAA sets management objectives for the Marine Sanctuary, designs and implements research programs, issues permits, and oversees environmental monitoring and enforcement of the regulations. NOAA also provides technical briefing material, designs and implements public information programs, provides administrative and emergency onsite support, and makes periodic onsite visits.

ONSITE MANAGER

In order to provide local supervision for the Marine Sanctuary, NOAA has a cooperative agreement with the State of Florida Department of Natural Resources (DNR) to serve as onsite manager. The Florida Department of Natural Resources also has management responsibility for the adjacent John Pennekamp Coral Reef State Park.

The onsite manager is responsible for evaluating permit applications, coordinating with the U.S. Coast Guard surveillance and enforcement, providing case documentation for notices of violation, and submitting semiannual reports to NOAA.

ENFORCEMENT AND SURVEILLANCE

Surveillance and enforcement are an integral part in the management and protection of the coral reef at Key Largo. Because the Marine Sanctuary is located adjacent to the John Pennekamp Coral Reef State Park, surveillance and enforcement are conducted cooperatively by the Florida Department of Natural Resources Park Rangers and the United States Coast Guard, patrolling both areas in the same boat from the same base at the State Park. Copies of Marine Sanctuary rules and regulations (Appendix A), which are compatible with those of the State Park, are available locally at the entrance of John Pennekamp Coral Reef State Park and at area dive shops. They were published in the Federal Register on January 16, 1976.

VIOLATION PROCEDURE

Violators are subject to civil penalties of up to \$50,000 under Public Law 92-532. They will be notified of the alleged violation at the scene by the issuance of a Coast Guard Report of Boarding (CG Form 4100). Evidentiary materials found in possession of a violator (e.g., corals, fish, spearguns, etc.) will be seized by Coast Guard personnel and statements taken. No further action against the violator will normally need to be taken at this time.

Copies of the Report of Boarding are distributed as follows: (1) violator (original), (2) NOAA Office of General Counsel, St. Petersburg, (3) State of Florida Park Service, and (4) United

States Coast Guard. Statements and evidentiary material are transferred with the copy of the Report of Boarding to the State of Florida Park Service. The Park Service evaluates all relevant information for sufficiency of the evidence and severity of the offense and sends a complete report of the violation along with a recommended penalty to be collected from the violator to the NOAA Office of General Counsel, St. Petersburg, Fla. The NOAA Office of General Counsel draws a Notice of Violation specifying the precise violation involved and the proposed penalty and sends it to the violator for appropriate action.

Coral regulations (43 CFR 6224) issued under the authority of Section 5, Outer Continental Shelf Lands Act may also be used against violators. Since these regulations provide for criminal penalties and involve arrest and appearance before a Federal Magistrate, their use is limited to those instances when the violator refuses to cooperate or when other acts necessitate the application of severe penalties or the circumstances warrant the statute's application.

RESEARCH AND PERMITS

Scientific research is encouraged in the Marine Sanctuary. Written application for the necessary permits should be submitted to the Assistant Administrator; Office of Coastal Zone Management; National Oceanic and Atmospheric Administration; 3300 Whitehaven Street, N.W.; Washington, D.C. 20235.

A permit application should provide sufficient information to enable the Assistant Administrator to evaluate the project and must include a description of all activities proposed, the equipment, methods, persons involved (particularly describing their relevant experience), and a timetable for completion. Copies of all other required licenses or permits should be attached.

In considering whether to grant a permit, the Assistant Administrator will evaluate such matters as the general professional and financial responsibility of the applicant; the appropriateness of the methods envisioned to the purpose of the research; the extent to which the conduct of any permitted activity may diminish or enhance the value of the Marine Sanctuary as a source of recreational, educational, or scientific information; the end value of the activity; and such other matters he deems appropriate.

EDUCATION

Public education is an essential element in the effective management of the area, because the Sanctuary is highly sensitive to environmental and user-related stresses.

NOAA has published several brochures for this purpose. These are available at the John Pennekamp Coral Reef State Park, local dive shops, or through the Office of Coastal Zone Management. *Protecting a National Treasure* describes the designation of the Marine Sanctuary and was NOAA's first publication on the Marine Sanctuary. *Our Fragile Coral Reefs—Enjoy But Don't Destroy* explains the basic ecology of the coral reef, its benefits, the threats to its existence, and the do's and don'ts for its protection. *Key Largo Coral Reef Marine Sanctuary* is a general information brochure that briefly describes every facet of the Marine Sanctuary from designation to present management plans. The Office of Coastal Zone Management also encourages freelance writers to avail themselves of the extensive subject matter the coral reef provides for articles. Representatives from OCZM are available to present talks on the Marine Sanctuary.

Also important in public education are the efforts of the Florida Park Service. It provides information to the visiting public stressing protection of the coral reef ecosystem and appreciation of its unique natural and cultural resources. The Park Service also is constructing a new visitor center at the John Pennekamp Coral Reef State Park headquarters to supplement its educational efforts.

INTERAGENCY COOPERATION

NOAA has the legal authority to control activities within the Marine Sanctuary through its Marine Sanctuary regulations. However, NOAA cannot directly control activities outside the Marine Sanctuary. It must rely instead on working through other agencies by making comments on permits and projects. This may take the form of comments on United States Army Corps of Engineer Permit Applications, EPA actions, Environmental Impact Statements, or State government actions.

OCZM realizes the importance of interagency cooperation in the achievement of mutual environmental goals and makes every effort to establish and maintain close interagency cooperation with appropriate offices.

With Biscayne National Monument (United State Park Service) to the north and John Pennekamp Coral Reef State Park to the west, the nature of the Marine Sanctuary location warrants close interagency cooperation.

OCZM works closely with the Florida Department of Natural Resources as a result of a cooperative agreement for onsite management.

The United States Park Service and the Office of Coastal Zone Management frequently collaborate in designing programs for environmental protection, such as water quality monitoring. The Bureau of Land Management and the Office of Coastal Zone Management are coordinating their work and streamlining their regulatory authorities in the Sanctuary. The U.S. Army Corps of Engineers and OCZM also have an understanding by Regulation (33 CFR 320.4[i]) that any permits applied for through the Corps of Engineers that would involve Marine Sanctuary waters must be first approved by OCZM.

In addition, the Office of Coastal Zone Management cooperates with regional Fisheries Management Councils on fishery management plans and attends Fishery Management Council meetings and participates on Fishery Management Council Advisory Committees.

MANAGEMENT ACCOMPLISHMENTS

Since the President's 1977 Environmental Message and the assignment of additional personnel to the Marine Sanctuary Program, the following management objectives have been accomplished.

- The violation procedure has been simplified and made more efficient by using a civil penalty traffic ticket system.
- U.S. Coast Guard and Florida Department of Natural Resources coordination has been improved, resulting in a significant increase in citations in 1978.
- NOAA Office of General Counsel, St. Petersburg, Fla., has clarified notice of violation procedures and developed a standard table for fines, making the system more efficient and consistent.
- A baseline geological assessment in cooperation with U.S. Geological Survey has been completed to determine the growth of the coral reef over the past fifty years, and provide insight into the geologic history of the reef.
- A bibliography has been compiled listing all past relevant scientific research conducted in the area.
- Permits have been granted to conduct research on coral carbonate production and the effects of drilling muds on coral; the ecology, behavior and physiology of corals; the ecology of the moray eel; and the concentration of heavy metals in the Sanctuary.
- A request for proposals for a biological inventory and reef health assessment has been developed and partly funded in fiscal year 1979.
- A study to collect past water quality data that deals with the Marine Sanctuary has begun.
- The first comprehensive management plan has been devised for the Marine Sanctuary.

MANAGEMENT GOALS

In order to develop an effective and efficient management system for the Marine Sanctuary, management priorities are divided into two basic groups: foundation and supportive. Those identified for 1979-1980 are essential for completing the foundation of a basic management strategy. Those after 1980 will be supportive of the basic established plan.

The following are foundation items that will be given priority in 1979 and 1980.

1. *Expand Duties and Responsibility of Onsite Manager*

At present funding levels the duties and responsibilities of the onsite manager are mostly limited to enforcement and surveillance activities.

In 1974 the Florida Coastal Coordinating Council made the following recommendation:

An immediate, intensive research effort should be established to ascertain physiological stresses of the Keys' coral reefs as a system. Such an effort should be designed to serve as a basis for active management of the reefs as a valuable public resource and should include provisions for monitoring their viability over time.

Comparable biological information on the condition of the reef is lacking in semiannual reports. If comparisons are to be made over time regarding the condition of the reef, a system to quantify significant changes is needed.

NOAA, in cooperation with the Florida DNR, will work to monitor, on a monthly basis, permanent stations established at environmentally different locations. A written log will be maintained for each site to include: observation of coral colonies for disease, mortality, growth, and recruitment; measurement of sedimentation; measurement of temperature, salinity, and turbidity; evidence of anchor damage, diver damage, or other use-related impact; life history observations for other invertebrates present. A copy of each month's log will be sent to the Office of Coastal Zone Management with a summary included in the annual report.

The onsite manager will publish an annual report to include (but not be limited to) the following items: environmental analysis including the summary of monthly monitoring stations, water quality studies, reef assessment studies, user-related impacts, and such other information as necessary; enforcement analysis including a summary of activities, notices of violations, case disposition, and related problems; visitor use including statistical information on number of visitors, points of entry and areas and type of use, and conclusion and recommendations including ways to improve reef management at Key Largo.

2. *Biological Inventory and Reef Health Assessment*

In an effort to provide a scientific data baseline upon which future changes can be judged and management decisions based, NOAA will give priority to completing a biological inventory, and reef health assessment.

The biological inventory will provide baseline data on the distribution, diversity, and abundance of organisms on the reef. The comparison of future inventories to these baseline data will enable managers to detect changes in population structures over time.

A reef health assessment will estimate the percent live coral versus dead coral cover on the reef and document the extent of coral disease and anchor damage. Future reassessments can be compared with this baseline to detect deteriorating conditions.

3. *Water Quality Assessment*

The water quality assessment will determine if water quality conditions are conducive to coral proliferation and provide baseline data to which future data can be compared. Organic pollutants, nutrients, temperature, salinity, turbidity, and other parameters will be used to monitor water quality.

4. *Deep Water Survey*

Approximately half of the Key Largo Coral Reef Marine Sanctuary lies in 100 to 300 feet (30-90 m) of water. To properly conserve and manage this area, it is necessary to understand the extent of the resource. Previous research has been limited to waters less than 100 feet (30 m) deep. Harbor Branch Foundation's Progress Report and Proposal of the Biology Group of the

Florida Keys Turbidity Project, 18 August 1973, indicates from *Johnson-Sea-Link* missions May 30–June 5, 1973, the existence of significant deepwater reefs. This deep reef ridge is located about 7.7 miles (12.4 km) offshore in 125 to 165 feet (40–50 m) of water and is believed to extend for miles in length along the Keys. Photographs taken on the ridge by Harbor Branch Foundation show a well-developed community of deepwater coral (*Agaricia agaricites*, *Montastrea cavernosa*) species.

In an effort to fill the significant gap in baseline data, NOAA plans to make a preliminary survey of the deepwater resources of the Marine Sanctuary. The survey will gather information on the location of deepwater reefs, associated organisms, and archaeological resources.

After a sound management foundation is built, priority after 1980 will be given to items that support this system.

1. Periodic Biological Inventory and Reef Health Assessment

A biological and reef health assessment, repeated every five years, will enable the Sanctuary managers to detect changes in the distribution, diversity, and abundance of coral reef populations and better understand the ecological evolution of the reef itself. In addition, the extent coral of disease and human-related damage can be quantified and management objectives updated to alleviate any stresses detected.

2. Anchor Damage Studies

The effect of anchoring on corals is not fully understood. In some species, outright breaking of the coral may actually increase propagation. In other species, simple scraping may lead to fatal infection of the coral. Research will be funded to closely investigate the effects of mechanical damage to the corals.

3. Coral Disease Studies

Like all living organisms, coral can be killed by disease. The coral reef at Key Largo is subject to natural temperature stresses because it is located at the northernmost fringe of coral reef development. The reef is also subjected to intense human-related stress. Coral under stress, either natural or human, is more susceptible to disease. NOAA will fund studies to better understand the causes of coral diseases, methods of alleviation, and the role of disease in the coral reef ecosystem.

4. Lobster Assessment

In order to better understand, conserve, and manage the reef's threatened commercially important species of lobsters, NOAA will fund studies to investigate critical aspects of the lobsters' life histories, including breeding habits, migration, growth, mortality, recruitment, distribution, and abundance.

5. Cultural Resources

The Key Largo Sanctuary has a large number of diverse cultural resources, including a lighthouse, a unique sculpture, and shipwrecks and their associated artifacts. NOAA will fund surveys to provide a rational foundation for managing these resources.

bibliography

Biology/Ecology

- AGASSIZ, L.: 1852; Report on the Florida Reefs; Senate Document No. 3; Documents of the Senate of the United States During the First Session of the Thirty-Second Congress, 1851-1852; 154-160.
- 1880; Report on Florida Reefs; Mem. Mus. Comp. Zool., Harv., 7; 1-61.
 - 1883; The Tortugas and Florida Reefs; Mem. Amer. Acad. Art. & Sciences; 11; 105 pp.
- ALEVIZON, W. S. and M. G. BROOKS: 1975; The Comparative Structure of Two Western Atlantic Reef-Fish Assemblages; Bull. Mar. Sci. 25; 482-490.
- ANONYMOUS: 1958; Report to the Florida State Board of Conservation. Investigation of Possible Effects of Dredging and Filling Elliott and Old Rhodes Keys; University of Miami, Rosenstiel School of Marine and Atmospheric Science.
- ANTONIUS, A.: 1973; Assoc. Isl. Mar. Lab. Carib. 10th Meeting Abstr.; Mayaguez, Puerto Rico; p. 3.
- 1974; Final Report of the Coral Reef Group of the Florida Keys Project for the Year 1973; Harbor Branch Foundation, Fort Pierce, Fla.; 201 pp.
 - 1975; Health Problems of the Florida Coral Reefs; Florida Scientist 38; p. 21.
 - 1977; Coral Mortality in Reefs: A Problem for Science & Management; In: Proceedings: Third International Coral Reef Symposium, 2, Geology; RSMAS, Miami, Fla.; 618-623.
- BARTSCH, P.: 1937; An Ecological Cross Section of the Lower Part of Florida Based Largely Upon its Molluscan Fauna; Natl. Res. Coun., Rept. Comm. Paleocology; 11-25.
- BAYER, F. M.: 1961; The Shallow-water Octocorallia of the West Indian Region; Martinus Nijhoff, The Hague, Netherlands; 373 pp.
- BRIGGS, J. C.: 1958; A List of Florida Fishes and Their Distribution; Bull. Fla. St. Mus.; 2(8); 233-318.
- CARY, L. R.: 1914; Observations Upon the Growth Rate and Ecology of Gorgonions; Carnegie Inst. Wash. Publ. 182; Pap. Tortugas Lab. V; 81 pp.
- 1918; The Gorgonaceae as a Factor in the Formation of Coral Reefs; Pap. Dept. Mar. Biol. Carn. Inst. Wash.; 9; 341 pp.
- CHESHER, R. H.: 1969; Contributions to the Biology of *Meoma ventricosa* (Echinoidea: Spatangoida); Bull. Mar. Science, 19(1); 72-110.
- DANA, J. D.: 1970; Corals and Coral Islands; New York; 3rd Ed.; 398 pp.
- DAVIS, G. E.: 1977; Anchor Damage to a Coral Reef on the Coast of Florida; Biol. Conserv. 11; 6 pp.
- DAVIS, W. D.: 1967; Ecological Interactions, Comparative Biology and Evolutionary Trends of Thirteen Pomadasyid Fishes at Alligator Reef, Florida Keys; Ph.D. Dissertation; RSMAS, University of Miami.
- DOLE, R. B. and A. A. CHAMBERS: 1918; Salinity of Ocean-Water at Fowey Rocks, Fla.; Papers from Tortugas Lab. IX, Carnegie Institute of Washington, Pub. 213; 299-316.
- DUSTAN, P.: 1977; Besieged Reefs of Florida Keys; Natural History, LXXXVII(4); 73-76.
- 1977; Vitality of Reef Coral Population Off Key Largo, Fla.: Recruitment and Mortality; Environmental Geol., 2(1); 51-58.

- EBBS, N. K.: 1966; Coral Inhibiting Polychaetes of Northern Florida Reef Tract, Part I; Bull. Mar. Science 16(3); 485-555.
- ELLIS, R. W., A. ROSEN and A. W. MOFFETT: 1958; A Survey of the Number of Anglers and of their Fishery Effort and Expenditures in the Coastal Recreational Fishery of Florida; Fla. Bd. Cons. Tech. Sec.; 24(1); 1-50.
- EMMERY, A. R.: 1973; Comparative Ecology and Functional Osteology of 14 species of Damselfish at Alligator Reef, Florida Keys; Bull. Mar. Sci. 23; 649-770.
- FEDDERN, M. A.: 1963; Aspects of Biology of the Bluehead Wrasse, *Thalassoma bifasciatum*; Master of Science Thesis; RSMAS, University of Miami.
– 1968; Systematics and Ecology of Western Atlantic Angelfishes, Family Chaetodontidae; Ph.D. Dissertation; RSMAS, University of Miami.
- FLORIDA COASTAL COORDINATING COUNCIL: 1974; Proceed. Florida Keys Coral Reef Workshop; State of Florida Dept. of Natural Res.; 38 pp.
– 1974; Florida Keys Coastal Zone Management Study; Florida Dept. of Natural Resources, Tallahassee, Fla.
- FLORIDA DIVISION OF STATE PLANNING: 1974; Final Report & Recommendations for the Proposed Florida Keys Area of Critical State Concern; Florida Bureau of Land & Water Management; Tallahassee, Fla.
- GREENFIELD, L. J.: 1952; Distribution of Marine Borers Area in Relation to Ecological Conditions; Bull. Mar. Sci. Gulf and Carib., 2(2); 448-464.
- GRIFFEN, G. M.: 1974; Case History of a Typical Dredge Fill Project in North Florida Keys. Effects of Water Clarity, Sedimentation Effects; and Biota; Harbor Branch Publ. #33.
– and A. ANTONIUS: 1974; Turbidity and Coral Health in Waters of John Pennekamp Park, Upper Keys (abst.); Florida Scientist 37; p. 15.
- HEIN, F. J. and M. J. RISK: 1975; Bioerosion of Coral Heads: Inner Patch Reefs, Florida Reef Tract; Bull. Mar. Sci. 25(1); 133-138.
- HUDSON, J. H.: 1977; Long-Term Bioerosion Rates on a Florida Reef: A New Method; Proceeding: Third Internat. Coral Reef Sym.; RSMAS, Miami, Fla., 2; 491-498.
- HUNT, E. B.: 1863; On the Origin . . . of the Florida Reef; Amer. Jour. of Sci.; Sec. 2, Vol. 35; 197-210.
- JONES, J. A.: 1963; Ecological Studies of the Southeastern Florida Patch Reefs Part I. Diurnal and Seasonal Changes in the Environment; Bull. Mar. Sci., 13(2); 282-307.
– 1977; Morphology and Development of Southeastern Florida Patch Reef; Proceedings: Third Internat. Coral Reef Sym.; RSMAS, Miami, Fla. 2; 231-236.
- JONES, R. S. and J. J. THOMPSON: 1978; Comparison of Florida Reef Fish Assemblages Using a Rapid Visual Technique; Bull. of Mar. Sci. 28(1); 159-172.
- KIER, P. M. and R. E. GRANT: 1965; Echinoid Distribution and Habits, Key Largo Coral Reef Reserve, Fla.; Smithsonian Misc. Coll. 149(6); 1-68.
- LEE, T. N.: 1975; Circulation and Exchange Processes in Southeast Florida Coastal Lagoons; RSMAS, University of Miami Technical Report 75-3; 54 pp.
- MANN, A.: 1936; Diatoms in Bottom Deposits from the Bahamas and the Florida Keys; Carnegie Instit. Wash. Publ. No. 452; Papers Tortugas Lab. V. 29; 121-128.
- MARTIN, R.: 1975; Distribution Ecology of Foraminifera of John Pennekamp Coral Reef State Park, Key Largo, Fla., with Emphasis Upon Effects of Turbid Water Produced by Dredging; Master of Science Thesis; University of Florida, Gainesville, Fla.
- MICHAEL, J. F.: 1972; Preliminary Hydrographic Study of Proposed Development of South Harbor Cay, Phase I, Ocean Reef, Key Largo; RSMSA, University of Miami Report #72063.

- 1972; A Hydrographic Study of the Proposed Development of Largo Cay, Key Largo, Monroe County, Fla.; Unpublished Report, RSMAS, University of Miami, Fla.
- 1972; A Study of the Hydrodynamic Effect of Additional Canal Construction at Port Largo Estates; Unpublished Report, RSMAS, University of Miami, Fla.
- 1975; Hydrodynamic Investigation for a Proposed Marina and Residential Development at Rock Harbor, Key Largo, Fla.; Unpublished Report, RSMAS, University of Miami, Fla.
- MILLER, W. I., R. T. MONTGOMERY, and A. W. COLLIER: 1977; A Taxonomic Survey of the Diatoms Associated with Florida Keys Coral Reefs; Proceedings: Third International Coral Reef Symposium; RSMAS, University of Miami, Miami, Fla. 1; 349-355.
- MONTGOMERY, R. T., W. I. MILLER, III, and A. W. COLLIER: 1977 A Preliminary Investigation of the Structure of Diatom Communities Associated with Reef Habitats of the Florida Keys; Proceedings: Third Internal. Coral Reef Symp., Miami, Fla. 1; 357-363.
- MOORE, W. E.: 1957; Ecology of Recent Foraminifera in Northern Florida Keys; Bull. Am. Assoc. Petro. Geol. 41; 727-741.
- MURDOCK, J: 1957; A Survey of Spearfishing in the Florida Keys; Proceedings Gulf and Carib. Fish. Inst., 9th Session, Nov. 1956; 112-120.
- POURTALES, L. F. de: 1870; Florida Reef Corals; Mem. Museum of Comparative Zoology, Harvard II.
- ROBERTSON, P. B.: 1963; Survey of the Marine Rock Boring Fauna of Southeast Florida; Master of Science Thesis; RSMAS, University of Miami.
- SCHROEDER, R. E. and W. A. STARCK, II: 1964; Photographing the Night Creatures of Alligator Reef; Natl. Geogr. Mag. 125(1); 128-154.
- SHINN, E. A.: 1966; Coral Growth Rate, An Environmental Indicator; Jour. Paleo. 40(2); 223-240.
- SMITH, F. G. W.: 1948; Atlantic Reef Corals; Univ. of Miami Press, Miami; 112 pp.
- SMITH, F. G. W., R. H. WILLIAMS, and C. DAVIS: 1950; An Ecological Survey of the Sub-tropical Inshore Waters Adjacent to Miami; Ecology 31(1); 119-140.
- STARK, W. A., II: 1966; Marvels of a Coral Realm; Natl. Geogr. Mag. 130(5); 710-738.
- 1968; A List of Fishes of Alligator Reef, Florida with Comments on the Nature of the Florida Reef Fish Fauna; Undersea Biol. 1(1); 1-40.
- and P. DAVIS: 1966; Night Habits of Fishes of Alligator Reef, Fla. Ichthyologica XXXVIII(4); 313-356.
- STEINKER, D. C., B. R. WEIS and R. F. WASZCZAK: 1977; Foraminiferal Assemblages Associated with South Florida Coral Reefs; Proceedings: Third Internal. Coral Reef Symposium; RSMAS, University of Miami; 2; 79-85.
- STEPHENSON, T. A. and A. STEPHENSON: 1950; Life Between Tide-Marks in North America. I. The Florida Keys; J. Ecol. 38(2); 354-402.
- 1972; Life Between the Tidemarks on Rocky Shores, W. M. Freedman, San Francisco; XII; 425 pp.
- THORP, E. M.: 1935; Calcareous Shallow Water Marine Deposits of Florida and Bahamas; Pap. Tortugas Lab. Carn. Inst. Wash. V. 29; 37 pp.
- VAUGHN, T. W.: 1909; Geology, Ecology and Effects of Environmental Factors in the Growth of Corals; Smith. Misc. Collect. Vol. 52(4); No. 1877; 461-464.
- 1911; Recent Madrepororia of Southern Florida; Yearb. Carneg. Inst. 9; 135-144.
- 1915; On Recent Madrepororia of Florida, Bahamas, and West Indies and on Collections from Murray Island, Australia; Carnegie Inst. Wash., Year Book; 221-231
- 1918; The Temperature of Florida Reef Tract; Pap. for Tortugas Lab., IX, Carnegie Institute of Washington, Pub. no. 213; 319-339.

- 1936; Current Measurements Along the Florida Coral Reef Tract; Carn. Inst. Wash. Publ. #452; Pap. Tortugas Lab. V. 29; 129-143.
- 1917; Corals and the Formation of Coral Reefs; Smith. Report 1917; 189-276.
- and A. W. SHAW: 1916; Geologic Investigation of the Florida Reef Tract; Carn. Inst. Wash. Year Book 14; 232 pp.
- VOSS, G. L.: 1968; Ecology and Dynamics of Coral Reef Populations, Florida; Natl. Geog. Soc. Res. Reports. 1963; 225-230.
- 1973; Sickness and Death in Florida's Coral Reefs; Nat. Hist. 82(7); 40-47.
- 1976; Seashore Life of Florida and the Caribbean; E. A. Seeman Publ., Inc.; Miami; 168 pp.
- and F. M. BAYER, C. R. ROBINS, M. GORMAN, and E. T. LAROE: 1969; Marine Ecology of Biscayne National Monument. Report to National Park Service. Dept. of Interior; Instit. of Marine and Atmosp. Science, University of Miami; 128 p.
- N. A. VOSS: 1955; An Ecological Survey of Soldier Key, Biscayne Bay, Fla.; Bull. Marine Sci. 5; 202-228.
- WOELKERLING, W. J.: 1976; South Florida Benthic Marine Algae; Sedimenta V; RSMAS, University of Miami, Fla.; 146 pp.
- ZEILLER, W.: 1974; Tropical Marine Invertebrates of Southern Florida and the Bahamas Islands; John Wiley and Sons, New York; 132 pp.

GEOLOGY

- BALL, M. M.: 1967; Carbonate Sand Bodies of Florida and the Bahamas; Jour. of Sed. Pet., 37(2); 556-591.
- and E. A. SHINN and K. W. STOCKMAN: 1967; The Geologic Effects of Hurricane Donna in South Florida; Jour. of Geology 75(5); 583-597.
- BANKS, J. E.: 1959; Limestone Conglomerates (Recent and Cretaceous) in Southern Florida; Bull. Amer. Assoc. Pet. Geol., 43(9); 2237-2243.
- DAVIS, W. M.: 1928; The Coral Reef Problem; Amer. Geographical Soc., Spec. publ. no. 9; PpVI; 596 pp.
- ENOS, P.: 1977; Holocene Sediment Accumulations of the South Florida Shelf Margin; In: GSA Memoir 147; Enos and Perkins (eds.)
- GINSBURG, R. N.: 1956; Environmental Relationship of Grain Size and Constituent Particles of Some South Florida Carbonate Sediments; Bull. Amer. Assoc. Petroleum Geol., 40(10); 2384-2427.
- (ed): 1972; South Florida Carbonate Sediments; Field Guide, Sedimenta II; RSMAS, University of Miami; 71 pp.
- and R. M. LLOYD, K. W. STOCKMAN and J. S. MCCALLUM: 1963; Shallow-Water Carbonate Sediments; The Sea; John Wiley and Sons; V. 3; 554-582.
- and H. LOWENSTAM: 1958; Influence of Marine Bottom Communities on the Depositional Environment of Sediments; Jour. Geol. 66(3); 310-318.
- and E. A. SHINN: 1964; Distribution of the Reef Building Community in Florida and the Bahamas; Bull. Am. Assoc. Petrol. Geol. 66; 310-318.
- and OTHERS: 1964; South Florida Carbonate Sediments: Guide Book for Field Trip No. 1, Nov., Geol. Soc. of Amer. Mtg. in Miami; 72 pp.
- HOFFMEISTER, J. E.: 1974; Land from the Sea. The Geologic Story of South Florida; University of Miami Press, Coral Gables, Florida; 143 pp.
- and J. I. JONES, J. D. MILLIMAN, D. R. MOORE and H. G. MULTER: 1964; Living and Fossil Reef Types of Southern Florida; Geol. Soc. Am. Conv., Nov., 1964; 28 pp.
- and H. G. MULTER: 1964; Growth-rate Estimates of a Pleistocene Coral Reef of Florida; Geol. Soc. Amer. Bul. 75; 353-357.
- and H. G. MULTER: 1968; Geology and Origin of the Florida Keys; Geol. Soc. America Bull. 79; 845-852.

- MARSZALEK, D. S., G. BABASHOFF, M. R. NOEL, and D. R. WORLEY: 1977; Reef Distribution in South Florida; Proc. Third. Internat. Coral Reef Symp.; Univ. of Miami, 2; 223-229.
- MULTER, H. G.: 1977 (1969); Field Guide to Some Carbonate Rock Environments. Florida Keys and Western Bahamas; 158 pp.
- PERKINS, R. D. and P. ENOS: 1968; Hurricane Betsy in the Florida-Bahama Area—Geologic Effects and Comparison With Hurricane Donna; Jour. Geol., 76; 710-717.
- SHALER, N. S.: 1890; The Topography of Florida; Bull. Museum of Comp. Zool., Vol. 16; 139-158.
- SHINN, E. A.: 1963; Spur and Groove Formation on the Florida Reef Tract; Jour. Sed. Pet. 33(2); 291-303.
- 1972; Coral Reef Recovery in Florida and the Persian Gulf; Shell Oil Company, Environmental Conservation Department, Houston, Tex.; 1-9.
- and J. H. HUDSON, R. B. HALLEY and B. LIDZ: 1977; Topographic Control and Accumulation Rate of Some Holocene Coral Reefs: South Florida and Dry Tortugas; Proc.: Third Internat. Coral Reef Symposium Miami, Fla., 2; 1-7.
- SWINCHATT, J. P.: 1965; Significance of Constituent Composition, Texture and Skeletal Breakdown in Some Recent Carbonate Sediments; Jour. Sed. Pet. 35; 71-90.
- TAFT, W. H. and HARBAUGH, J. W.: 1964; Modern Carbonate Sediments of Southern Florida, Bahamas, and Espireta Santo Island, Baja California. Comparison of their Mineralogy and Chemistry; Stanford Univer. Publ.; Univ. Sec.; Geol. Sci. 8; 1-133.
- THORP, E. M.: 1936; Calcareous Shallow-Water Marine Deposits of Florida and the Bahamas; Carnegie Inst. Wash. Publ. No. 452; Paps. Tortugas Lab. V 29; 37-119.
- VAUGHN, T. W.: 1910; Geology of the Keys, the Marine Bottom Deposits, and Recent Corals of Southern Florida; Yearb. Carneg. Inst. 8; 140-144.

UNDERWATER ARCHEOLOGY

- BROOKFIELD, C. M.: 1941; Cannon on Florida Reefs Solve Mystery of Sunken Ship; Nat. Geo. Mag.; Dec. 1941, 807-824.
- and GRISWOLD, O.: 1949; They All Called it Tropical, Banyan Books, Inc.: Miami, Fla.; 77 pp.
- CAPPO, J.: 1963; Christ of the Deep; Skin Diver, 12(2); page 25.
- FREHSEE, R.: 1978; Florida Shipwrecks; Sport Diver, V. 2; 81-86.
- GRISWOLD, O.: 1965; Florida Keys and the Coral Reef; Miami; 143 pp.
- PARKS, A. M.: 1977; The Forgotten Frontier; Banyan Books, Inc.; Miami, Fla.; 178 pp.
- WATSON, M.: 1970; The 1733 Plate Fleet; Skin Diver, 19(6); 4 pp.

GENERAL PUBLIC INTEREST

- ANONYMOUS: 1961; Undersea scapes: Molasses Reef; Underwater 1(2); 16-25.
- ANONYMOUS: 1978; Underwater Weekend; Mills Publications, Inc.; 48 pp.
- ARNOLD, B. and P. ARNOLD: 1977; Dive America. The Fabulous Keys; Dive America, Inc.
- BARADA, B.: 1971; Rape of Florida's Coral Reefs; Skin Diver, 20(2); 14-19.
- 1975; Keys Dive Guides Fight to Save Coral; Skin Diver, 24(12); 41-45.

- 1973; The Battle of Pennekamp Park. Part I Power Play for Pennekamp Profits; *Skin Diver*, 22(2); 10-15.
 - 1973; The Battle of Pennekamp Park. Part II Pennekamp's Cat and Dog Fight; *Skin Diver*, 22(3); 6 pp.
 - 1973; The Battle of Pennekamp Park. Part III The Real Threat to Pennekamp; *Skin Diver*, 22(4); 20-23.
- CHAPLIN, C. C. G.: 1972; Fish watchers guide to West Atlantic Coral Reefs; Livingston Pub. Camp., Wynnwood, Pa.; 64 pp.
- GREENBERG, I.: 1967; Take an U/W Trip to Pennekamp Park; *Skin Diver*, 16(11); 28-33.
- 1977; Guide to Corals and Fishes of Florida, the Bahamas, and the Caribbean; Seahawk Press, Miami, Fla.; 64 pp.
- GREENBERG, J.: 1961; Exploring the World's First Undersea Park; *Audubon* 63(3); 140-147.
- TZIMOULIS, P.: 1971; Night Diving in the Florida Keys; *Skin Diver*, 20(10); 44-46.
- 1975; Scuba Guide to Florida Keys; *Skin Diver*, 24(6); 74-79.
 - 1975; Key Largo—Home of Pennekamp Park; *Skin Diver*, 24(10); 58-62.
 - 1976; The Elbow; *Skin Diver*, 25(4); 76-79.
 - 1976; Molasses Reef; *Skin Diver*, 25(8); 72-77.
- VELDE, P. and N. DELOACH: 1973; Diving Guide to the Florida Keys; New World Publications; 66 pp.

appendices

LEGISLATION



Public Law 92-532
92nd Congress, H. R. 9727
October 23, 1972

An Act

86 STAT. 1052

To regulate the transportation for dumping, and the dumping, of material into ocean waters, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Marine Protection, Research, and Sanctuaries Act of 1972".

Marine Protection, Research, and Sanctuaries Act of 1972.

FINDING, POLICY, AND PURPOSE

SEC. 2. (a) Unregulated dumping of material into ocean waters endangers human health, welfare, and amenities, and the marine environment, ecological systems, and economic potentialities.

(b) The Congress declares that it is the policy of the United States to regulate the dumping of all types of materials into ocean waters and to prevent or strictly limit the dumping into ocean waters of any material which would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities.

To this end, it is the purpose of this Act to regulate the transportation of material from the United States for dumping into ocean waters, and the dumping of material, transported from outside the United States, if the dumping occurs in ocean waters over which the United States has jurisdiction or over which it may exercise control, under accepted principles of international law, in order to protect its territory or territorial sea.

DEFINITIONS

SEC. 3. For the purposes of this Act the term—

(a) "Administrator" means the Administrator of the Environmental Protection Agency.

(b) "Ocean waters" means those waters of the open seas lying seaward of the base line from which the territorial sea is measured, as provided for in the Convention on the Territorial Sea and the Contiguous Zone (15 UST 1606; TIAS 5639).

(c) "Material" means matter of any kind or description, including, but not limited to, dredged material, solid waste, incinerator residue, garbage, sewage, sewage sludge, munitions, radiological, chemical, and biological warfare agents, radioactive materials, chemicals, biological and laboratory waste, wreck or discarded equipment, rock, sand, excavation debris, and industrial, municipal, agricultural, and other waste:

but such term does not mean oil within the meaning of section 11 of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1161) and does not mean sewage from vessels within the meaning of section 13 of such Act (33 U.S.C. 1163).

Ante, p. 816.

(d) "United States" includes the several States, the District of Columbia, the Commonwealth of Puerto Rico, the Canal Zone, the territories and possessions of the United States, and the Trust Territory of the Pacific Islands.

(e) "Person" means any private person or entity, or any officer, employee, agent, department, agency, or instrumentality of the Federal Government, of any State or local unit of government, or of any foreign government.

(f) "Dumping" means a disposition of material: *Provided*, That it does not mean a disposition of any effluent from any outfall structure to the extent that such disposition is regulated under the provisions of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1151-1175), under the provisions of section 13 of the Rivers and Harbors Act of 1899, as amended (33 U.S.C. 407), or under the provisions of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011, et seq.), nor does it mean a routine discharge of effluent incidental to the propulsion of, or operation of motor-driven equipment on, vessels: *Provided further*, That it does not mean the construction of any fixed structure or artificial island nor the intentional placement of any device in ocean waters or on or in the submerged land beneath such waters, for a purpose other than disposal, when such construction or such placement is otherwise regulated by Federal or State law or occurs pursuant to an authorized Federal or State program: *And provided further*, That it does not include the deposit of oyster shells, or other materials when such deposit is made for the purpose of developing, maintaining, or harvesting fisheries resources and is otherwise regulated by Federal or State law or occurs pursuant to an authorized Federal or State program.

(g) "District court of the United States" includes the District Court of Guam, the District Court of the Virgin Islands, the District Court of Puerto Rico, the District Court of the Canal Zone, and in the case of American Samoa and the Trust Territory of the Pacific Islands, the District Court of the United States for the District of Hawaii, which court shall have jurisdiction over actions arising therein.

(h) "Secretary" means the Secretary of the Army.

(i) "Dredged material" means any material excavated or dredged from the navigable waters of the United States.

(j) "High-level radioactive waste" means the aqueous waste resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated waste from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuels, or irradiated fuel from nuclear power reactors.

(k) "Transport" or "transportation" refers to the carriage and related handling of any material by a vessel, or by any other vehicle, including aircraft.

TITLE III—MARINE SANCTUARIES

"Secretary."

SEC. 301. Notwithstanding the provisions of subsection (h) of section 3 of this Act, the term "Secretary", when used in this title, means Secretary of Commerce.

15 UST 471.

SEC. 302. (a) The Secretary, after consultation with the Secretaries of State, Defense, the Interior, and Transportation, the Administrator, and the heads of other interested Federal agencies, and with the approval of the President, may designate as marine sanctuaries those areas of the ocean waters, as far seaward as the outer edge of the Continental Shelf (15 U.S.T. 74; TIAS 5578), of other coastal waters where the tide ebbs and flows, or of the Great Lakes and their connecting waters, which he determines necessary for the purpose of preserving or restoring such areas for their conservation, recreational, ecological, or esthetic values. The consultation shall include an opportunity to review and comment on a specific proposed designation.

43 USC 1301.

(b) Prior to designating a marine sanctuary which includes waters lying within the territorial limits of any State or superjacent to the subsoil and seabed within the seaward boundary of a coastal State, as that boundary is defined in section 2 of title I of the Act of May 22, 1953 (67 Stat. 29), the Secretary shall consult with, and give due consideration to the views of, the responsible officials of the State involved. As to such waters, a designation under this section shall become effective sixty days after it is published, unless the Governor of any State involved shall, before the expiration of the sixty-day period, certify to the Secretary that the designation, or a specified portion thereof, is unacceptable to his State, in which case the designated sanctuary shall not include the area certified as unacceptable until such time as the Governor withdraws his certification of unacceptability.

(c) When a marine sanctuary is designated, pursuant to this section, which includes an area of ocean waters outside the territorial jurisdiction of the United States, the Secretary of State shall take such actions as may be appropriate to enter into negotiations with other Governments for the purpose of arriving at necessary agreements with those Governments, in order to protect such sanctuary and to promote the purposes for which it was established.

(d) The Secretary shall submit an annual report to the Congress, on or before November 1 of each year, setting forth a comprehensive review of his actions during the previous fiscal year undertaken pursuant to the authority of this section, together with appropriate recommendation for legislation considered necessary for the designation and protection of marine sanctuaries.

Annual report
to Congress.

(e) Before a marine sanctuary is designated under this section, the Secretary shall hold public hearings in the coastal areas which would be most directly affected by such designation, for the purpose of receiving and giving proper consideration to the views of any interested party. Such hearings shall be held no earlier than thirty days after the publication of a public notice thereof. Hearings.

(f) After a marine sanctuary has been designated under this section, the Secretary, after consultation with other interested Federal agencies, shall issue necessary and reasonable regulations to control any activities permitted within the designated marine sanctuary, and no permit, license, or other authorization issued pursuant to any other authority shall be valid unless the Secretary shall certify that the permitted activity is consistent with the purposes of this title and can be carried out within the regulations promulgated under this section. Regulations.

(g) The regulations issued pursuant to subsection (f) shall be applied in accordance with recognized principles of international law, including treaties, conventions, and other agreements to which the United States is signatory. Unless the application of the regulations is in accordance with such principles or is otherwise authorized by an agreement between the United States and the foreign State of which the affected person is a citizen or, in the case of the crew of a foreign vessel, between the United States and flag State of the vessel, no regulation applicable to ocean waters outside the territorial jurisdiction of the United States shall be applied to a person not a citizen of the United States.

SEC. 303. (a) Any person subject to the jurisdiction of the United States who violates any regulation issued pursuant to this title shall be liable to a civil penalty of not more than \$50,000 for each such violation, to be assessed by the Secretary. Each day of a continuing violation shall constitute a separate violation. Penalties.

(b) No penalty shall be assessed under this section until the person charged has been given notice and an opportunity to be heard. Upon failure of the offending party to pay an assessed penalty, the Attorney General, at the request of the Secretary, shall commence action in the appropriate district court of the United States to collect the penalty and to seek such other relief as may be appropriate.

(c) A vessel used in the violation of a regulation issued pursuant to this title shall be liable in rem for any civil penalty assessed for such violation and may be proceeded against in any district court of the United States having jurisdiction thereof.

Jurisdiction.

(d) The district courts of the United States shall have jurisdiction to restrain a violation of the regulations issued pursuant to this title, and to grant such other relief as may be appropriate. Actions shall be brought by the Attorney General in the name of the United States, either on his own initiative or at the request of the Secretary.

Appropriation.

SEC. 304. There are authorized to be appropriated for the fiscal year

LEGISLATION (continued)

in which this Act is enacted and for the next two fiscal years thereafter such sums as may be necessary to carry out the provisions of this title, including sums for the costs of acquisition, development, and operation of marine sanctuaries designated under this title, but the sums appropriated for any such fiscal year shall not exceed \$10,000,000.

Approved October 23, 1972.

LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 92-361 (Comm. on Merchant Marine and Fisheries) and No. 92-1546 (Comm. of Conference).

SENATE REPORT No. 92-451 (Comm. on Commerce).

CONGRESSIONAL RECORD:

Vol. 117 (1972): Sept. 8, 9, considered and passed House.

Nov. 24, considered and passed Senate, amended.

Vol. 118 (1972): Oct. 13, Senate and House agreed to conference report.

WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS:

Vol. 8, No. 44 (1972): Oct. 28, Presidential statement.

RULES AND REGULATIONS

Title 15—Commerce and Foreign Trade

CHAPTER IX—NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, DEPARTMENT OF COMMERCE

PART 929—KEY LARGO CORAL REEF MARINE SANCTUARY

Interim Regulations

JANUARY 13, 1976.

On December 18, 1975, the Secretary of Commerce designated as a marine sanctuary an area of the Atlantic Ocean adjacent to but excluding the State of Florida's John Pennnekamp Coral Reef State Park. This ocean area is directly east of the city of Key Largo, Florida. The marine sanctuary boundary begins at the outer boundaries of the state park and extends seaward to about the 300 foot isobath. Included within the marine sanctuary area is the Key Largo Coral Reef Preserve.

The Key Largo Coral Reef Marine Sanctuary was designated pursuant to the authority of section 302(a) of the Marine Protection, Research and Sanctuaries Act of 1972 (86 Stat. 1052, Pub. L. 92-532, hereafter referred to as the Act).

Section 302(f) of the Act directs the Secretary to issue necessary and reasonable regulations to control any activities permitted within a designated marine sanctuary. This section also provides that no permit, license, or other authorization issued pursuant to any other authority shall be valid unless the Secretary shall certify that the permitted activity is consistent with the purposes of Title III of the Act ("Marine Sanctuaries"); and that it can be carried out within the regulations promulgated under section 302(f).

The authority of the Secretary to administer the provisions of the Act has been delegated to the Administrator, Na-

tional Oceanic and Atmospheric Administration, U.S. Department of Commerce (hereafter the Administrator, 39 FR 10255, March 19, 1974).

There are published herewith interim regulations relating to activities to be prohibited or permitted in the Sanctuary, and relating to the certification requirement described above. Comments upon these regulations are invited through February 20, 1976. Comments should be addressed to the Administrator, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C. 20230. Following the close of this comment period, any comments received will be reviewed. At the discretion of the Administrator, these interim regulations will be amended so as to reflect any such comments. The Administrator shall then publish final regulations in the FEDERAL REGISTER. As authorized by 5 U.S.C. 553(d) (3), these interim regulations are effective in order to

protect the Sanctuary until final regulations become effective.

Sec.	
929.1	Authority.
929.2	Description of the Sanctuary.
929.3	Marine Sanctuary Management System.
929.4	Activities prohibited within the Sanctuary.
929.5	Penalties for Commission of Prohibited Acts.
929.6	Permitted activities.
929.7	Permit procedures and criteria.
929.8	Certification procedures.
929.9	Appeals of administrative action.

AUTHORITY: Secs. 302(f), 302(g) and 303 of the Act.

§ 929.1 Authority.

The Sanctuary has been designated by the Secretary of Commerce pursuant to the authority of section 302(a) of the Act. The following regulations are issued pursuant to the authorities of sections 302(f), 302(g) and 303 of the Act.

§ 929.2 Description of the Sanctuary.

The Sanctuary consists of a portion of the water column in the Atlantic Ocean beginning at approximately three miles east of the city of Key Largo, Florida. The coordinates for the marine sanctuary are: the point of beginning (POB) is geographic coordinates 25° (degrees), 19.45' (minutes) north latitude, 80° (degrees), 12.0' (minutes) west longitude, said point being the northeast boundary corner of John Pennekamp Coral Reef State Park. From said POB run thence southeasterly to geographic coordinates 25° (degrees), 16.2' (minutes) north latitude 80° (degrees), 8.7' (minutes) west longitude, said point also being on the 300 foot isobath, thence in a southwesterly direction to geographic coordinates 25° (degrees), 07.5' (minutes) north latitude 80° (degrees), 12.5' (minutes) west longitude, thence again run in a southwesterly direction to geographic coordinates 24° (degrees), 58.3' (minutes) north latitude, 80° (degrees), 19.8' (minutes) west longitude, thence leaving said 300 foot isobath run northwesterly to geographic coordinates 25° (degrees), 2.2' (minutes) north latitude, 80° (degrees), 25.25' (minutes) west longitude, said point being the southeast boundary corner of John Pennekamp Coral Reef State Park, thence in a northeasterly direction along said easterly boundary of said state part to the POB.

§ 929.3 Marine Sanctuary Management System.

(a) The National Oceanic and Atmospheric Administration (hereinafter referred to as NOAA) has the primary responsibility for the management of the Marine Sanctuary pursuant to the Act. NOAA's responsibilities under the Act require that the Office of Coastal Zone Management (OCZM) review, consider and approve any activities that take place in the Sanctuary pursuant to these rules and regulations.

(b) NOAA will be assisted in the ad-

ministration of the marine sanctuary by the State of Florida's Department of Natural Resources, Division of Recreation and Parks pursuant to an agreement between the State of Florida and NOAA. Pursuant to this agreement, the State of Florida will endeavor to serve as the on site manager of the Sanctuary. The State of Florida will be assisted in its role as the on site manager by an advisory board consisting of representatives from the Department of Interior's National Park Service; the U.S. Coast Guard; the U.S. Department of Justice; NOAA's National Marine Fisheries Service; and the State of Florida's Division of Marine Resources, Florida's Division of Marine Law Enforcement, Florida's Department of Environmental Regulation; local citizen association, and Association of Dive Boat Captains.

§ 929.4 Activities Prohibited Within the Sanctuary.

Present and future uses of the Sanctuary include recreational boating and fishing, snorkeling and scuba diving, commercial transport, fisheries activities and scientific endeavors. Those activities allowed within the marine sanctuary, however, will be subject to the following rules and regulations which are intended to provide for the maximum public use consistent with the primary purpose of the establishment of the Sanctuary. Except as may be permitted by the Administrator of NOAA, no person subject to the jurisdiction of the United States shall conduct, nor cause to be conducted, any of the following activities in the Sanctuary.

(a) *Removal or destruction of natural features and marine life.* (1) No person shall destroy, injure, harmfully disturb or remove beach sand, gravel or minerals, corals, sea feathers and fans, shells and shellfish (except lobster, crawfish and stone crab), starfishes or other marine invertebrates, seaweeds, grasses, or any soil, rock, artifact, stone or other material. Nor shall any person have possession of any of the above listed items within the boundaries of the Sanctuary regardless of their place of extraction.

(2) No person shall cut, carve, injure, mutilate, move or displace or break off any bottom formation of growth.

(3) No rope, wire anchor, or other object shall be attached to any coral, rock or other formation.

(b) *Dredging, filling, excavating and building activities.* (1) No dredging, excavating or filling operations of any kind are to be carried out within the boundaries of the Sanctuary. No materials of any sort may be deposited in or on the waters of the sanctuary.

(2) No structure of any kind, whether permanent or temporary, may be constructed or built.

(3) No public service facility may be constructed or extended into, upon or across the Sanctuary, with the exception of marking and mooring buoys or stations.

(c) *Discharge of refuse and polluting substances.* No person shall discharge or deposit any waste materials into the waters of the Sanctuary. Specifically prohibited are wastes, acids, oil liquid wastes or other deleterious chemicals, bottles, broken glass, paper, boxes, dirt, rubbish, garbage, refuse, human waste or other foreign substances.

(d) *Archaeological and historic substances.* No person shall willfully destroy, molest, deface, remove, displace or tamper with an archaeological or historical resource or cargo pertaining to submerged wrecks within the boundaries of the Sanctuary.

(e) *Markers.* No person shall willfully mark, deface or damage in any way, or displace, remove or tamper with any signs, notices or placards, whether temporary or permanent, or with any monuments, stakes, posts or other boundary markers installed by the sanctuary manager or markers placed for the purpose of lobster pot fishing.

(f) *Fishing.* (1) Sport and commercial fishing is allowed in the Sanctuary with hook and line for the purpose of taking surface, mid-water or bottom fishes. Furthermore, the taking of crawfish, spiny lobster and stone crab with traps is allowed for commercial purposes. All traps shall be marked, color coded and numbered at all times.

(2) Fishes normally resident in the coral formations (often categorized as tropical fishes which are of minimal sport and food value, and are usually brightly colored and thus used for aquaria purposes) and which live in a direct interrelationship with the corals, may not be caught or collected, except inadvertently by hook and line.

(3) The use of poisons, electric charges and similar methods for the taking of fish is prohibited.

(4) Some portions of the Sanctuary may be set aside as control areas for research to assist in managing the sanctuary. Those areas designated by the sanctuary manager will be closed to fishing. No more than 20 percent of the Sanctuary may be closed at any given time for this purpose.

(g) *Scuba diving and skin diving activities.* (1) Diving for underwater observation and photography is allowed and encouraged in the Sanctuary as a compatible and desirable use.

(2) Divers are prohibited from handling coral formations, standing on coral formations or otherwise disturbing the corals within the boundaries of the Sanctuary.

(h) *Operation of watercraft.* (1) All watercraft shall be operated in accordance with applicable Federal rules and regulations. The following additional constraints will also be imposed within the boundaries of the sanctuary.

(2) No watercraft should be operated in such a manner as to strike or otherwise cause damage to the natural features of the marine sanctuary.

(3) Except in case of emergency situ-

ation where life and property may be endangered, no anchor should be cast or dragged in such a way as to damage any coral reef formations. Anchors shall be dropped on sand flats off the reefs and placed so as not to drift into the coral formations.

(4) No watercraft should be operated at greater than 4 miles per hour or in such a manner to create a wake in the vicinity of divers, sightseeing boats or fishermen, with the exception of law enforcement officials while in the performance of their duties.

(5) All watercraft from which diving operations are being conducted shall fly in a conspicuous manner, the red and white "divers down" flag.

(6) No boat under power shall approach closer than 100 yards to a boat displaying the diving flag except at a minimum speed of 4 miles per hour. Divers shall stay within 100 yards of their diving flag.

(7) Boats anchored or proceeding at slow speeds for fishing or observation shall be approached or passed at such slow speed that the wake of the approaching or passing boat does not disturb the fishing or observation boats.

(8) Watercraft must use mooring buoys, stations or anchoring areas when such facilities and areas have been designated and are available.

(i) **Photography.** (1) Photography, both surface and underwater, without involving the installation of special settings or structures is encouraged.

(2) No person shall take still or motion pictures, either commercial or private, involving the use of special settings or structures that would be likely to interface with either the coral or the use and enjoyment of the Sanctuary by other persons.

(j) **Advertising or publicity.** No person shall erect or cause to be erected any signs, slogans or markers within the Sanctuary.

(k) **Explosives and dangerous weapons.** (1) Distress signalling devices are considered necessary and proper for safe vessel operation. Knives are frequently used by fishermen and swimmers and are not classified as weapons for the purposes of these regulations.

(2) No person shall carry or possess, except while passing through the Sanctuary or for law enforcement purposes, firearms or weapons of any description. The use of air rifles, guns, bows and arrows, slings, spear guns, harpoons or other kinds of weapons potentially harmful to human safety, fish and wildlife and the reef structure is strictly prohibited within the Sanctuary except for law enforcement purposes.

(3) The use of explosives within the Sanctuary is prohibited. No person is allowed to possess explosives in the Sanctuary except while passing through the Sanctuary.

§ 929.5 Penalties for Commission of Prohibited Acts.

(a) Section 303 of the Act authorizes the assessment of a civil penalty of not more than \$50,000 for each violation of any regulation issued pursuant to the Act, and further authorizes a proceeding in rem against any vessel used in violation of any such regulation. Details are set out in Subpart D of Part 922 (15 CFR Part 922) of this chapter (39 FR 23254, 23257, June 27, 1974). Subpart (D) is applicable to any instance of a violation of these regulations.

(1) The U.S. Coast Guard shall have the responsibility for surveillance and the enforcement of these regulations pursuant to 14 U.S.C. 89.

(2) The Sanctuary may be closed to public use in the event of emergency conditions endangering life or property. Certain areas may also be closed (but the total closed area shall not exceed 20 percent of the total Sanctuary at any one time) in order to (i) permit recovery of the living resources from overuse, or (ii) to provide for scientific research relating to protection and management. Public notice of closures will be made by informing the local news media.

(3) Accidents involving personal injury or damage to property in excess of \$100 shall be reported to the Sanctuary Manager as soon as possible by the person or persons involved.

§ 929.6 Permitted Activities.

Any person or entity may conduct in the Sanctuary any activity listed under § 929.4 if: (a) Such activity is either (1) for the purpose of research related to the resources of the Sanctuary, or (2) pertains to salvage or recovery operations; and (b) such person or entity is in possession of a valid permit issued by the Administrator of NOAA authorizing the conduct of such activity; except that, no permit is required for the conduct of any activity immediately and urgently necessary for the protection of life, property, or the environment.

§ 929.7 Permit procedures and criteria.

(a) Any person or entity who wishes to conduct in the Sanctuary an activity for which a permit is authorized by § 929.6 (hereafter a permitted activity) may apply in writing to the Administrator for a permit to conduct such activity citing this section as the basis for the application. Such application should be made to the Administrator, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C. 20230. Upon receipt of such application, the Administrator shall request, and such person or entity shall supply to the Administrator, such information and in such form as the Administrator may require to enable him to act upon the application.

(b) In considering whether to grant a permit for the conduct of a permitted activity for the purpose of research related to the resources of the Sanctuary, the Secretary shall evaluate such matters as (1) the general professional and fi-

nancial responsibility of the applicant; (2) the appropriateness of the research method(s) envisioned to the purpose(s) of the research; (3) the extent to which the conduct of any permitted activity may diminish or enhance the value of the Sanctuary as a source of recreational, esthetic or scientific information; (4) the end value of the research envisioned; and (5) such other matters as the Administrator deems appropriate.

(c) In considering whether to grant a permit for the conduct of a permitted activity in the Sanctuary in relation to an air or marine casualty, the Administrator shall consider such matters as (1) the fitness of the applicant to do the work envisioned; (2) the necessity of conducting such activity; (3) the appropriateness of any activity envisioned to the purpose of the entry into the Sanctuary; (4) the extent to which the conduct of any such activity may diminish the value of the Sanctuary as a source of recreational, esthetic or scientific information; and (5) such other matters as the Administrator deems appropriate.

(d) In considering any application submitted pursuant to this Section, the Administrator may seek and consider the views of any person or entity, within or outside of the Federal Government, as he deems appropriate.

(e) The Administrator may, in his discretion, grant a permit which has been applied for pursuant to this section, in whole or in part, and subject to such condition(s) as he deems appropriate, except that the Administrator shall attach to any permit granted for research related to the Sanctuary the condition that any information obtained in the research shall be made available to the public. The Administrator may observe any activity permitted by this section; and/or may require the submission of one or more reports of the status or progress of such activity.

(f) A permit granted pursuant to this Section is nontransferable.

(g) The Administrator may amend, suspend or revoke a permit granted pursuant to this section, in whole or in part, temporarily or indefinitely, if, in his view, the permit holder (hereafter the Holder) has acted in violation of the terms of the permit; or the Administrator may do so for other good cause shown. Any such action shall be in writing to the Holder, and shall set forth the reason(s) for the action taken. Any Holder in relation to whom such action has been taken may appeal the action as provided in § 929.8.

§ 929.8 Certification procedures.

Any Federal agency which, as of the effective date of these regulations, already has permitted, licensed or otherwise authorized any prohibited activity in the Sanctuary shall notify the Administrator of this fact in writing. The writing shall include a reasonably detailed description of such activity, the person(s) involved, the beginning and end-

ing dates of such permission, the reason(s) and purpose(s) for same, and a description of the total area affected. The Administrator shall then decide whether the continuation of the permitted activity, in whole or in part, or subject to such condition(s) as he may deem appropriate, is consistent with the purposes of Title III of the Act and can be carried out within these regulations. He shall inform the Federal agency of his decision in these regards, and the reason(s) therefor, in writing. The decision of the Secretary made pursuant to this section shall be final action for the purpose of the Administrative Procedure Act.

§ 929.9 Appeals of Administrative Action.

(a) In any instance in which the Administrator, as regards a permit authorized by, or issued pursuant to, this part: (1) Denies a permit; (2) issues a permit embodying less authority than was requested; (3) conditions a permit in a manner unacceptable to the applicant; or (4) amends, suspends, or revokes a permit for a reason other than the violation of regulations issued under this part, the applicant or the permit holder, as the case may be (hereafter the Appellant), may appeal the Administrator's action to the Secretary of Commerce. In order to be considered by the Secretary, such appeal shall be in writing, shall state the action(s) appealed and the reason(s) therefor, and shall be submitted within

30 days of the action(s) by the Administrator. The Appellant may request a hearing on the appeal.

(b) Upon receipt of an appeal authorized by this Section, the Secretary may request, and if he does, the Appellant shall provide, such additional information and in such form as the Secretary may request in order to enable him to act upon the appeal. If the Appellant has not requested a hearing, the Secretary shall decide the appeal upon (1) the basis of the criteria set out in § 929.7(b) or § 929.7(c), as appropriate, (2) information relative to the application on file in NOAA, (3) information provided by the Appellant, and (4) such other considerations as he deems appropriate. He shall notify the Appellant of his decision, and the reason(s) therefore, in writing within 30 days of the date of his receipt of the appeal.

(c) If the Appellant has requested a hearing, the Secretary shall grant an informal hearing before a Hearing Officer designated for that purpose by the Secretary after first giving notice of the time, place, and subject matter of the hearing in the FEDERAL REGISTER. Such hearing shall normally be held no later than 30 days following publication of the notice in the FEDERAL REGISTER. However, the Hearing Officer may extend the time for holding the hearing when deemed equitable. The Appellant and any interested person may appear personally or

by counsel at the hearing, present evidence, cross-examine witnesses, offer argument and file a brief. Within 30 days of the last day of the hearing, the Hearing Officer shall recommend in writing a decision to the Secretary based upon the considerations outlined in paragraph (b) of this section and based upon the record made at the hearing.

(d) The Secretary may adopt the Hearing Officer's recommended decision, in whole or in part, or may reject or modify it. In any event, the Secretary shall notify the Appellant of his decision, and the reason(s) therefore, in writing within 15 days of his receipt of the recommended decision of the Hearing Officer. The Secretary's action, whether without or after a hearing, as the case may be, shall constitute final action for the purposes of the Administrative Procedure Act.

(e) Any time limit prescribed in this Section may be extended by the Secretary for good cause, either upon the Secretary's own motion and upon written notification to an Appellant stating the reason(s) therefore, or upon the written request of an Appellant to the Secretary stating the reason(s) therefore, except that no time limit may be extended more than 30 days.

T. P. GLEITER,
Assistant Administrator
for Administration.

[FR Doc.76-1379 Filed 1-15-76; 8:45 am]

MEMORANDUM OF UNDERSTANDING

U. S. Army Corps of Engineers

§320.4 General policies for evaluating permit applications.

The following policies shall be applicable to the review of all applications for Department of the Army permits. Additional policies specifically applicable to certain types of activities are identified in Parts 321-324 of this chapter.

(i) *Activities in marine sanctuaries.* Applications for Department of the Army authorization for activities in a marine sanctuary established by the Secretary of Commerce under authority of Section 302 of the Marine Protection, Research and Sanctuaries Act of 1972, as amended, will be evaluated for impact on the marine sanctuary. No permit will be issued until the applicant provides a certification from the Secretary of Commerce that the proposed activity is consistent with the purposes of Title III of the Marine Protection, Research and Sanctuaries Act of 1972, as amended, and can be carried out within the regulations promulgated by the Secretary of Commerce to control activities within the marine sanctuary. Authorizations so issued will contain such special conditions as may be required by the Secretary of Commerce in connection with his certification.

PENN STATE UNIVERSITY LIBRARIES



A000071290461

